May 1995 Issue #45

# Radio Fun

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"The beginner's guide to the exciting world of amateur radio."

## in this issue

### features



### user reports



### vintage review



### departments



## Photo Search

Shoot our next *73 Amateur Radio Today* or *Radio Fun* cover photo! Suitable subjects might be ham gear, amazing antenna arrays, or better—your own catchy ideas. We prefer color prints (from 35mm or larger formats) that are vertically oriented, sharply focused, not too "busy," and (for *73*) leave extra room at the top and left side. Send 'em to *Photo Search, Radio Fun, 70 Route 202N, Peterborough NH 03458,* with a brief description, your full name and callsign, and permission to publish. We can't return photos without an SASE. If it doesn't make the cover, we might find a spot inside. Selected photos earn you a free subscription or renewal. Good luck!

## New Ham Band

Ham radio has a new band. The FCC has released a Report and Order allocating the 219 to 220 MHz band on a secondary basis to the Amateur Service for point-to-point fixed digital message forwarding systems.

When the new rules take effect (date to be announced), Technician and higher class amateur licensees will be permitted to use digital emissions of up to 100 kHz bandwidth and up to 50 watts PEP output.

To protect the band's primary occupant, Automated Maritime Telecommunications Systems (AMTS), the Amateur Radio Relay League has been designated as the national contact point for all amateur operations in the 219-220 MHz band. Amateur stations must notify the ARRL at least 30 days prior to initiation of operations in the band. Within certain distances from AMTS coast stations, amateurs must obtain written approval of the AMTS licensee prior to operating. The ARRL will assist amateurs in fulfilling these requirements.

Amateurs operating in this band must not interfere with, nor are they protected from interference by, primary service operations in and adjacent to the band. *TNX ARRL.*

## Best of 75 Net

No, you are not listening to another case of malicious interference on some Los Angeles area 2 meter repeater. Rather, this is a weekly on air competition. It's found every Sunday night on the Best of 75 Meters Net, a place where representatives of all other frequencies can compete against one another to see which one has the strongest signal on the band. Literally a ham radio horse race!

But there is also a serious side to The Best of 75 Meters Net. Each week, net control station Don Simpson KO4TA brings on a well-known guest speaker over his autopatch. One of the first was W5YI VEC Administrator Fred Maia, who fielded questions on a wide variety of topics including the vanity callsign program.

The Best of 75 Meters Net meets every Sunday for at least three hours starting at 7 p.m. Eastern time. Look for it on 3.975 MHz, sit back and enjoy a grand old ham radio fun time! *TNX Amateur Radio Newsline, Feb. 27, 1994.*

# Talk about a "skywire"!


**KA1FPP communicates by kite in the desert southwest of the Las Vegas strip. Wanna try it yourself? You might find some helpful ideas in his story on page 4.**

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# ASTRON POWER SUPPLIES

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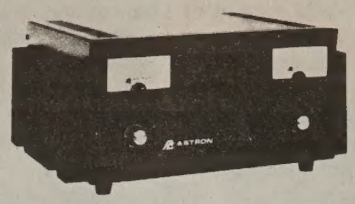


MODEL VS-50M

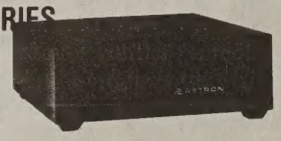
### SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output
- CROWBAR OVER VOLTAGE PROTECTION on all Models except RS-3A, RS-4A, RS-5A, RS-4L, RS-5L
- MAINTAIN REGULATION & LOW RIPPLE at low line input Voltage
- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE
- THREE CONDUCTOR POWER CORD except for RS-3A
- ONE YEAR WARRANTY • MADE IN U.S.A.

### PERFORMANCE SPECIFICATIONS

- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- All units available in 220 VAC input voltage (except for SL-11A)

## SL SERIES



• LOW PROFILE POWER SUPPLY

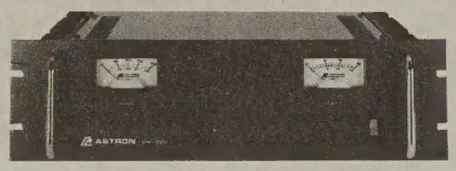
| MODEL | Colors Gray | Colors Black | Continuous Duty (Amps) | ICS* (Amps) | Size (IN) H × W × D | Shipping Wt. (lbs.) |
|---|---|---|---|---|---|---|
| SL-11A | • | • | 7 | 11 | 2⅝ × 7⅝ × 9¾ | 12 |
| SL-11R | • | • | 7 | 11 | 2⅝ × 7 × 9¾ | 12 |
| SL-11S | • | • | 7 | 11 | 2⅝ × 7⅝ × 9¾ | 12 |
| SL-11R-RA | | • | 7 | 11 | 4¾ × 7 × 9¾ | 13 |

## RS-L SERIES

• POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE

| MODEL | Continuous Duty (Amps) | ICS* (Amps) | Size (IN) H × W × D | Shipping Wt. (lbs.) |
|---|---|---|---|---|
| RS-4L | 3 | 4 | 3½ × 6⅛ × 7¼ | 6 |
| RS-5L | 4 | 5 | 3½ × 6⅛ × 7¼ | 7 |

## RM SERIES



MODEL RM-35M

• 19" RACK MOUNT POWER SUPPLIES

| MODEL | Continuous Duty (Amps) | ICS* (Amps) | Size (IN) H × W × D | Shipping Wt. (lbs.) |
|---|---|---|---|---|
| RM-12A | 9 | 12 | 5¼ × 19 × 8¼ | 16 |
| RM-35A | 25 | 35 | 5¼ × 19 × 12½ | 38 |
| RM-50A | 37 | 50 | 5¼ × 19 × 12½ | 50 |
| RM-60A | 50 | 55 | 7 × 19 × 12½ | 60 |
| • Separate Volt and Amp Meters | | | | |
| RM-12M | 9 | 12 | 5¼ × 19 × 8¼ | 16 |
| RM-35M | 25 | 35 | 5¼ × 19 × 12½ | 38 |
| RM-50M | 37 | 50 | 5¼ × 19 × 12½ | 50 |
| RM-60M | 50 | 55 | 7 × 19 × 12½ | 60 |

## RS-A SERIES

MODEL RS-7A

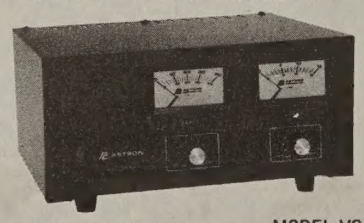
| MODEL | Colors Gray | Colors Black | Continuous Duty (Amps) | ICS* (Amps) | Size (IN) H × W × D | Shipping Wt. (lbs.) |
|---|---|---|---|---|---|---|
| RS-3A | | • | 2.5 | 3 | 3 × 4¾ × 5¾ | 4 |
| RS-4A | • | • | 3 | 4 | 3¾ × 6½ × 9 | 5 |
| RS-5A | | • | 4 | 5 | 3½ × 6⅛ × 7¼ | 7 |
| RS-7A | • | • | 5 | 7 | 3¾ × 6½ × 9 | 9 |
| RS-7B | • | • | 5 | 7 | 4 × 7½ × 10¾ | 10 |
| RS-10A | • | • | 7.5 | 10 | 4 × 7½ × 10¾ | 11 |
| RS-12A | • | • | 9 | 12 | 4½ × 8 × 9 | 13 |
| RS-12B | | • | 9 | 12 | 4 × 7½ × 10¾ | 13 |
| RS-20A | • | • | 16 | 20 | 5 × 9 × 10½ | 18 |
| RS-35A | • | • | 25 | 35 | 5 × 11 × 11 | 27 |
| RS-50A | • | | 37 | 50 | 6 × 13¾ × 11 | 46 |
| RS-70A | • | | 57 | 70 | 6 × 13¾ × 12⅛ | 48 |

## RS-M SERIES

MODEL RS-35M

| MODEL | Continuous Duty (Amps) | ICS* (Amps) | Size (IN) H × W × D | Shipping Wt. (lbs.) |
|---|---|---|---|---|
| • Switchable volt and Amp meter | | | | |
| RS-12M | 9 | 12 | 4½ × 8 × 9 | 13 |
| • Separate volt and Amp meters | | | | |
| RS-20M | 16 | 20 | 5 × 9 × 10½ | 18 |
| RS-35M | 25 | 35 | 5 × 11 × 11 | 27 |
| RS-50M | 37 | 50 | 6 × 13¾ × 11 | 46 |
| RS-70M | 57 | 70 | 6 × 13¾ × 12⅛ | 48 |

## VS-M AND VRM-M SERIES



MODEL VS-35M

• Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

| MODEL | Continuous Duty (Amps) @13.8VDC | @10VDC | @5VDC | ICS* (Amps) @13.8V | Size (IN) H × W × D | Shipping Wt. (lbs.) |
|---|---|---|---|---|---|---|
| VS-12M | 9 | 5 | 2 | 12 | 4½ × 8 × 9 | 13 |
| VS-20M | 16 | 9 | 4 | 20 | 5 × 9 × 10½ | 20 |
| VS-35M | 25 | 15 | 7 | 35 | 5 × 11 × 11 | 29 |
| VS-50M | 37 | 22 | 10 | 50 | 6 × 13¾ × 11 | 46 |
| • Variable rack mount power supplies | | | | | | |
| VRM-35M | 25 | 15 | 7 | 35 | 5¼ × 19 × 12½ | 38 |
| VRM-50M | 37 | 22 | 10 | 50 | 5¼ × 19 × 12½ | 50 |

## RS-S SERIES

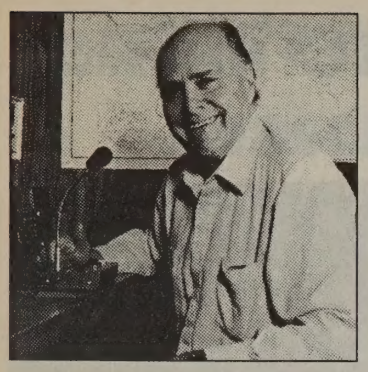
MODEL RS-12S

• Built in speaker

| MODEL | Colors Gray | Colors Black | Continuous Duty (Amps) | ICS* Amps | Size (IN) H × W × D | Shipping Wt. (lbs.) |
|---|---|---|---|---|---|---|
| RS-7S | • | • | 5 | 7 | 4 × 7½ × 10¾ | 10 |
| RS-10S | • | • | 7.5 | 10 | 4 × 7½ × 10¾ | 12 |
| RS-12S | • | • | 9 | 12 | 4½ × 8 × 9 | 13 |
| RS-20S | • | • | 16 | 20 | 5 × 9 × 10½ | 18 |
| SL-11S | • | • | 7 | 11 | 2¾ x 7⅝ x 9¾ | 12 |

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

CIRCLE 16 ON READER SERVICE CARD



# QLF

**by Wayne Green W2NSD/1**

### Amateur Radio and The War On Poverty

The recent PBS series on President Johnson's futile war on poverty made it pretty clear that throwing money at the problem hasn't worked. Most of the thrown money ends up in the hands of the government bureaucrats. That reminds me of the quote about the missionaries going to Hawaii to do good, and doing very well indeed. America's "war on poverty" has cost taxpayers trillions of dollars, and helped build an even larger federal bureaucracy which has made the poverty situation worse.

Maybe there *is* no solution to the poverty problem. Maybe there will always be poor people. Yes, there probably always will, but there don't have to be as many of them. Not nearly as many. So what's happening that's generating generation after generation of poor people, and what can be done to break the insidious pattern?

You may at first think I'm really stretching to claim that amateur radio can be a big part of the solution. So how can I make the claim that amateur radio can be instrumental in helping eliminate much of the poverty in America (or anywhere else in the world, for that matter)?

Let's start with fundamentals. If you've given any thought to the poverty problem, you've certainly noticed that there are very few really poor people with good educations. Oh, I know a couple, but they are certified nut cases and are thus unable to work despite their education. As a good general rule let's agree that education and poverty don't go together. You may also have noticed that very few rich people are uneducated. This is not a coincidence.

Okay, if we want to get rid of poverty we're going to have to somehow see that poor kids get educated. And this isn't going to be easy. I won't go into the gory details, but we're saddled with one of the worst government-run school systems in the world, plus parents who are busy teaching their children how to stay poor, and peer pressure (gangs) pushing them to drop out of school.

Immigrant Asian parents, who emphasize the importance of education to their children, prove that the parents have a powerful impact on their kids. Though often poor, they see to it that their children get a good education and move out of poverty, despite our terrible school system.

There are some practical solutions to improving our schools and to generating an interest in poor parents to encourage their children to be educated. I've covered this territory in some depth in my ***Declare War*** book and its updates, so I won't repeat all that.

### So Where Does Amateur Radio Fit In?

It's a high-tech world. Our kids have to cope with the information superhighway, and that means computer literacy, a need to understand electronics, television, and so on. A generation ago we used typewriters, today it's word processors. It wasn't very long ago that we used pens, blotters and pen wipers. There aren't very many blotter manufacturers any more. If any.

Just as there is a strong parallel between education and success in life, in today's world there is also a parallel between high-tech and success. Scientists, engineers, and technicians are being more and more needed to fuel the changes in our society. Communications and transportation are speeding up and getting cheaper. This is putting every worker in America on a more level playing field with workers around the world. If your job can be done as well or better by a foreign worker at a lower cost, you're going to lose out. Job protection can't be legislated. One's job protection is one's accumulation of skills and knowledge.

Here comes amateur radio.

As a scientific hobby, amateur radio has the potential for interesting youngsters in learning about electronics and communications. Even computers are an integral part of hamming these days. One of the big keys to making our American school system more effective is to make it more fun to learn. Hamming, where we have a group of around 73 hobbies, has almost unlimited fun for youngsters. It is a key to getting them to learn because they want to, not because the government will punish them if they don't go to school.

Back in the 1950s, before our only national amateur radio organization, the ARRL and their so-called "Incentive Licensing" proposal to the FCC, destroyed both the ham industry and the infrastructure which was feeding youngsters into the hobby, studies showed that 80% of all new licensees were youngsters and that 80% of those went on to high-tech careers as a result. That's what happened to me.

Indeed, amateur radio was the major supplier of scientists, engineers and technicians for our country. When World War II came along 80% of our hams enlisted. As did I. When I went to the Navy electronics school I found hams everywhere. Virtually all the instructors were hams. Later, when I went into ham publishing, I found that a high percentage of the top people in the electronics and communications industries were hams who had, like me, started in their teens. In the 1950s 50% of all new hams were 14 or 15 years old!

In those days virtually every high school had a ham radio club. That's what got me going. I went to Erasmus Hall High School in Brooklyn (NY). My interest in building radios and listening to the shortwaves got me to join the club. From there on the club members got me to practice the code and get my ham license. These clubs were almost all wiped out by ARRL's Incentive Licensing mess 30 years ago. That's when the hobby stopped growing, going from 11% growth per year (for 17 years) to less than 1% most years since then. That's when every major ham equipment manufacturer and 85% of the ham dealers went out of business.

Packet radio is an exciting aspect of the hobby. It gets kids to learn about computers and digital communications because they want to. Slow- and fast-scan television teaches them about video and digital data compression. Ham satellite communications helps them learn to deal with microwaves. And all of this is real fun!

I've been urging every ham radio club in America to get busy and get radio clubs restarted in our schools so we can regain our lost amateur radio infrastructure. Today we need to get kids interested in high-tech when they are 8-10 years old. This is why I've proposed that we start teaching the fundamentals of electronics in every school in grades 5-12. There is less and less need in business for people who are ignorant of technology. Almost everyone has to deal with computers and communications in their work, so the more they understand what they are doing, the more valuable they are going to be. The man or woman who looks up helplessly when his or her computer stops working will be replaced by a more self-sufficient worker.

We're heading into a world of video conferencing, telemarketing, and information handling. Good jobs await those with the skills and knowledge to deal with this world. Poverty awaits those who don't keep up.

Amateur radio is by far the best hobby there is for getting youngsters interested in learning the things which will be of the more help to them later on. There are a bunch of other scientific hobbies, but none of them have such a wide variety of interests and excitement to offer.

We have DXers, who are mainly interested in contacting foreign countries. We have specialists who love contests, who want to see how many countries they can contact on some particular ham band, such as 160 or 80 meters. We have awards for contacting all states, and so on, which can be very difficult on some ham bands. We have weirdos (like me) who love to visit countries which haven't many active hams and get on the air for a few days, making thousands of short contacts and providing DXers with a confirmation of a new country contacted.

Most hams get interested in building their own equipment. Some buy kits and assemble them. Others buy the basic parts and build. At the Dayton hamfest every year there are acres of hams selling equipment and parts at the flea market. There are over 2200 such exhibits. And parts are being sold at every hamfest and convention around the country. It's fun to build and get something new to work.

Unless we in America use every stratagem to get our kids to build their skills and high-tech knowledge, youngsters in other countries are going to take their jobs. Just look at the way Asian countries such as Japan, Taiwan, Hong Kong, Singapore, Thailand, Malaysia, and India have been pulling themselves from incredible poverty to wealth. I've been visiting these countries for over 35 years now and I have seen the unbelievable changes firsthand. In Japan, there are more than twice as many ham radio operators per capita as we have. Every school in Japan has a radio club. Is it any wonder they've been able to take away every consumer electronics industry of ours?

We invented the transistor, they marketed it. We invented videotape, they marketed it. And so on. We don't make TV sets any more. We don't make cassette recorders or VCRs. Japan makes about 90% of our audio equipment. When I visit their factories in Japan I am met with Japanese hams at every turn.

What can you do about all this? That's easy: Start helping your local schools to form radio clubs and get kids interested in amateur radio. It'll be the best thing you can do for the kids, for America, and for yourself. Yes, the school administrators will probably fight you at every turn. Try my motto: Never Say Die! Get on your local school board and keep on the pressure. We need tens of thousands of school radio clubs and millions of new hams. Maybe tens of millions. We have more than enough frequencies available. Heck, we're using less than 0.3% of our ham bands today.

What are you doing sitting there? Why aren't you calling your local schools to arrange to talk with the 8- to 10-year-old kids about hamming? RF

# Newcomers

**by Wayne Green W2NSD/1**

### The Way It Was

Since I'm sending a sample issue of this publication to newly licensed hams—with the perhaps naive hope that they'll subscribe—I thought I might compare hamming today with the way it was when I got started in the hobby. I'm by far the oldest geezer in the ham publishing business, so my memories go waaaay back.

Like when I first got on the air in 1938. Back then all newcomers to the hobby started out on 160m if they were using voice, and almost everyone else was on 40m with CW. The 40m band was CW only, from 7000-7300 kHz (kc, then). Everyone was crystal-controlled, so the normal practice was to call CQ—a fairly long CQ—and then start at one end of the band or the other and tune for someone calling. These calls, too, were fairly long, to allow time for one's signal to be found. Before VFOs were invented, that was the way it was. You had a frequency. Crystals were expensive so you didn't buy a bunch. The best ran around $3.50. To put that into context, that's a lot like $70 in today's inflated dollarettes. The cheapies were $1.75.

Most of the 160m AM phone rigs were low-powered. Usually a 6L6 crystal oscillator, modulated by a 6L6, using a D1 carbon microphone stolen from a phone booth. Five watts. In those early days many of us would work duplex, listening on one end of the band and transmitting on the other. Yes, of course we used separate antennas.

The Class A hams were up on 75m and 20m phone, where kilowatts ruled the roost. Those phone bands were only 100 kHz wide, so there was only room for about nine round tables on each band.

There were two ham magazines, *QST,* and *Radio.* I liked *Radio* the best by far. It had better construction articles and it told what was actually going on in the ARRL, which is something no one could ever know from reading *QST.* Much like today, actually. There were a bunch of dyed-in-the-wool brainwashed ARRL-Forever hams. Just like today. And the Directors held them in disdain. Well, some things never seem to change.

The League was put together by Hiram Percy Maxim and he ran it as a benevolent dictatorship. I remember reading a book by him about his father, *A Genius In The Family.* Great book! But then Hiram was a really great guy. I'd have enjoyed knowing him, but he died around 1936. When he suddenly died there was the usual battle for his spot. Eventually the most devious won, just like we see in countries when a benevolent dictator dies.

I remember reading articles about how the top brass at the ARRL helped give away the 7300-8000 kHz part of our 40m band to commercial interests, and suddenly somewhere found the money to build new houses.

So here we are almost 60 years later and look how things have changed! Our phone bands are wider. 20m ends at 14,350 instead of 15,000. 10m ends at 29.7 instead of 30.0. We have a not-very-useful 40m phone band. We've got a couple of new mini bands. 160m has been pared down from the 1715-2050 we used to have. 6m no longer goes from 50-60 MHz.

But today we have over 10 times as many active hams as we did then, yet the QRM isn't much worse. Part of that is due to SSB vs. AM. More of it is due to far better receiver selectivity.

**Continued on page 5**

# Portable Communications and the Wind

**by James A. Bassett KA1FPP/7**

For years now I've had an old Gibson Girl antenna rolled up in my ham radio junk box. This is one of those things I found at a ham-fest, and thought it might be fun to try when I find one of the Gibson Girl box kites in the future. Well, it's been more than 10 years and I still haven't found the kite. Fear not, for with a renewed interest in kites it's now time to see what will work with the ham operators' theory of "Put something in the air and radiate—what have you got to lose?"

Because the antenna is of unknown age, I thought it best not to test its breaking strength by using it as the kite string, as originally designed. Instead, the kite is launched on a string, with the antenna attached to a second anchor point two inches below. No tension is placed on the antenna. The kite is a Delta with a six-foot wing span and will fly with as little as 5 mph wind. This configuration is best used for low winds, as high wind causes this style of kite to dance wildly in direction and height. SWR variations during high winds don't make for consistent communications at QRP levels. For higher winds, a more stable kite, such as a box kite, might prove a good investment.

***"I'm still looking for that Gibson Girl box kite, or the measurements of the original to make a reproduction."***

The antenna's total length is approximately 320 feet. Since I live in a neighborhood that has small yards, this vertical is a dramatic improvement over my "150 feet of roof flashing" antenna on top of my two-story home. Also, going into the desert away from the city greatly decreases all the man-made noises that plague radio reception. Signal strength improved by 40 dB.

This particular station consists of an Argonaut 505, a Quantum battery (2.5 Ah), 20 feet of RG-58, 100 feet of four-conductor telephone wire (counterpoise), 500 feet of nylon kite string, a 100-foot measuring tape, an explosion-proof CW key (with completely enclosed contacts; the type used in Navy aircraft), leather gloves (kite string can burn your hands), the wire antenna, the kite, the associated log book, a scratch pad, and pens and pencils. All this fits inside a catalog case. This is a compact station for taking on camping trips, or just out for an afternoon of ham radio.

The ideal kite, of course, would be the Marconi design that automatically adjusted its height to the wind gust. My local library does not have any pictures or details of those historic designs. I would be interested in hearing from anyone who has seen one, or knows where this information can be obtained. I'm still looking for that Gibson Girl box kite, or the measurements of the original to make a reproduction. Those working Field Day with a nice breeze might give this a try. What more can I say? These antennas still work. RF

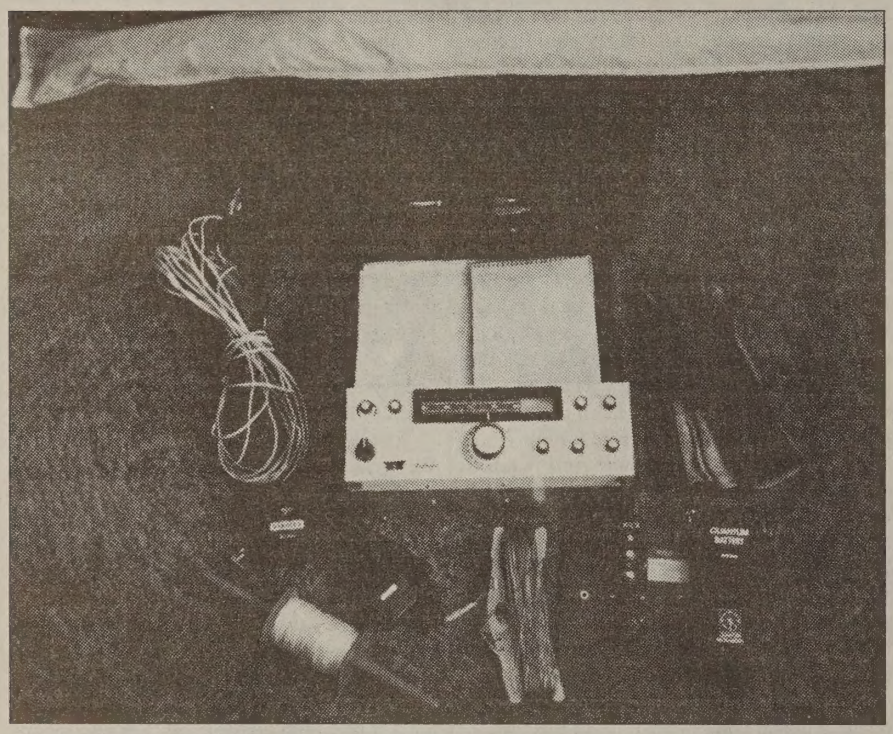


**Photo A. The complete station, prior to packing: Argonaut 505, logs/scratch pad, gloves, battery, CW key, antenna (on kite string winder), kite string, microphone, measuring tape, coax and counterpoise, catalog case, kite (in pink case).**

**Photo B. The station packed for transport.**

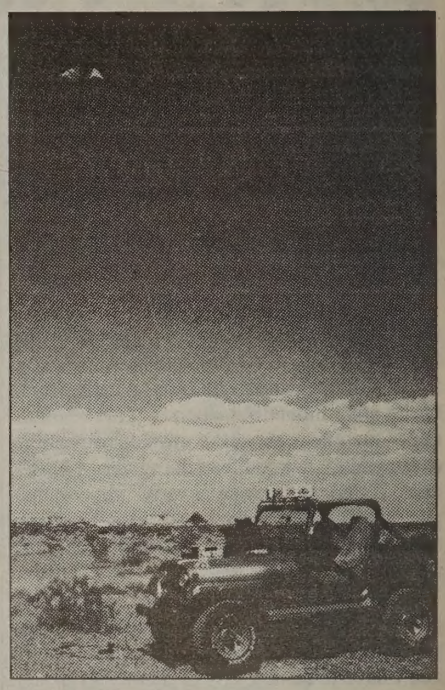


**Photo D. The station set up on the vehicle's hood (Las Vegas strip in the background).**

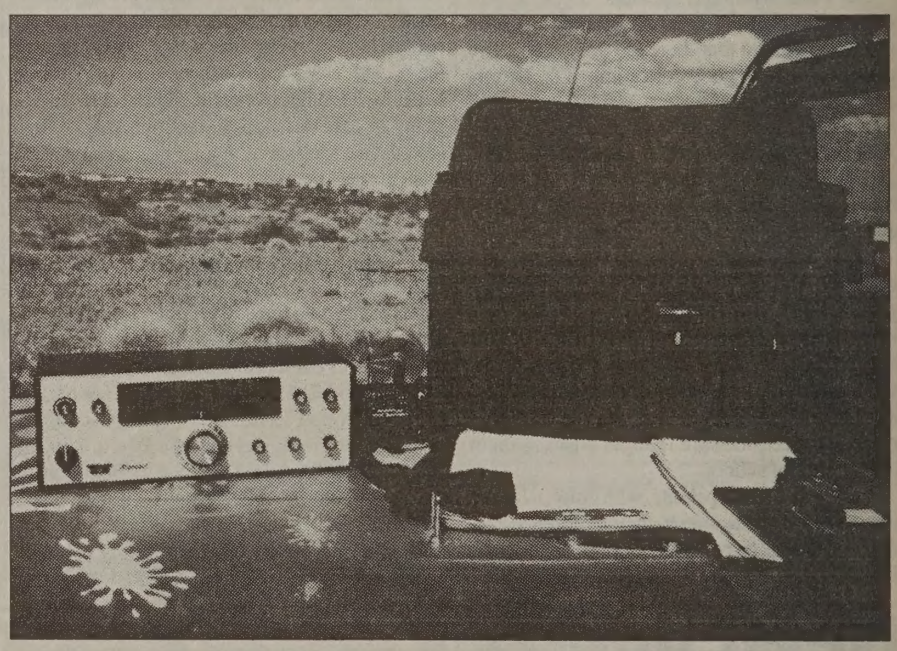


**Photo C. The station set up for operation.**

### The Gibson Girl

The Gibson Girl antenna is a special wire-braid-over-nylon-string radiator designed and used with survival radios used by the United States Navy. The Gibson Girl radio is so named because of its shape—it resembles the waistline of the Gibson Girls of the 1800s.

This radio was strapped securely between the thighs of a survivor. A hand crank was attached to the top of the radio. The operator turned the crank to generate electricity. Inside a front door of this radio was mounted a spool of antenna wire. One end of the wire was attached to either a balloon or a kite, depending on wind conditions. As either the kite or the balloon ascended, the wire was fed out accordingly. The remaining end of the wire was attached to the radio frequency (RF) output connector at the front of the Gibson Girl.

Also located on the front of the radio was a button used to send Morse code as the hand crank was turned to create a source of power. A selector switch allowed for non-Morse operators to choose the automatic position, which would transmit a canned emergency message alternately on two predetermined distress frequencies. The Gibson Girl radio's output was approximately 8 watts.

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# Radio Fun

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# letters

**Write to: Radio Fun Letters**
**70 Route 202-N,**
**Peterborough, NH 03458**

**K. E. Holcomb KB5RUZ, Tulsa OK** I'm a fairly new ham of a little over three years. I hold an Advanced Class ticket. Wayne, I can partially thank you for that. At your urging to try something new, I decided to try my hand at satellite work. Since I only have a TS-430 and a couple of 2m FM rigs, the only way out (and the cheapest) was to upgrade and get on RS-12. Well, I did, I have, and it's great fun! Thanks for the tip!

I dabbled in electronics when I was a kid and went on to become a test technician in the latter part of the '60s. I joined the Army as a radar repairman and did my part for king and country for three not-so-bad years. Eventually I realized that I enjoyed electronics more as a hobby than as a vocation. Since I had always enjoyed doing "hands-on" things, I became a welder. Yes, I know . . . ham radio and welding . . . *strange* combination. Hey, it's not everyone who gets to work with 600 amp power supplies every day! Being a welder and a ham does have its advantages. I built my own tower for less than fifty bucks. It's only 35 feet (I don't want to worry the neighbors), with a tilt-over winch setup, but it holds up my quad just fine. I also *never* worry about elements coming loose on my home-brew yagis.

Wayne, I hope to catch you on the air sometime. You already know what kind of rig and antenna I have so if we put our heads together maybe we can think of something else to talk about!

**Bruce Miller KC7IAY, Seattle WA** I find some of your articles on basic radio theory, or parts of radio theory, to be quite helpful. Even though I took the first step and got a no-code Tech license, passing the test is no guarantee of complete understanding of radio theory. I find that if I do a little reading each month, prompted by *Radio Fun,* my knowledge accumulates easily. So, please continue to have these basic articles to help explain radio and electronic theory, which will in turn help us move onward into higher licenses.

**Tony Liscio, Port Saint Lucie FL** I have a story to tell you and the readers of *Radio Fun.* On March 17, St. Patrick, myself, and several other hams were putting up a top section of an antenna for a repeater station at Rick KO4CZ's home. Well, unbeknownst to us, a 2-1/2-foot black snake had made himself at home inside the top section. We raised the section up 80 feet to John KE4VHH. After putting the section up he saw the snake. Boy, did he yell!

As John proceeded to put on the top section, the snake came out and hit his wrist. Down came the snake. I took a stick and chased it into the bushes.

After all that excitement, we finally got Rick's tower up. We then had coffee, doughnuts, and some good laughs. RF

# Newcomers


**Continued from page 3**


In 1938 there was a choice, AM phone or CW. Today we have CW, SSB phone, RTTY, packet, NBFM, slow-scan TV, fast-scan TV, AMTOR, Clover, repeaters, and so on. We've got a bunch of ham satellites up there which few hams have ever bothered to use. We've got hams using moonbounce. Some playing with meteor scatter. Others waiting for auroras to bloom.

We now have complete ham stations we can put in our shirt pocket. It doesn't take a millionaire to run a kilowatt like it did 60 years ago. More's the pity.

Before WWII I was mostly on 160m and 2-1/2m. Then, after the war, when war surplus equipment lowered the cost of a kilowatt, I built a pp-813 all-band final, and drove it with a surplus BC-459 Command transmitter I'd converted. I went back to finish my last two years of college courtesy of the government and set up my station in the basement of my fraternity house. I swung a couple of Twin-3 wire beam antennas between the trees and the house and had a potent signal all around the world. I had a ball working DX on 20m. In later years, when I had a chance to travel, I had the fun of seeing my old QSL cards on the walls in ham shacks in places like Australia and India.

Now, you newcomers, are you going to get stuck up on 2m or are you going to get your feet wet on the low bands, working DX?

I didn't really get into DXing heavy duty after college until I moved to New Hampshire in 1962 and put up a 100-foot tower. Within a week I'd worked 100 countries on 20m phone. Two hundred within a month, and 300 in less than a year. Once I reached 300 I stopped counting. I worked 100 countries in one weekend on 20m, just to be able to brag to you that I've done it. Well, it was a lot of fun doing it too.

Yes, some of my DX contacts were just the usual dull signal reports, but most of the time I picked a good clear frequency and called CQDX so I'd have a better chance at getting an interesting chat. Most of my contacts lasted at least 20-30 minutes, and many led to long friendships. When I got to traveling, I enjoyed being able to talk with the same friends, no matter where I was operating from. And it was even better when I could visit.

It wasn't until I'd been hamming 20 years and was the editor of *CQ* that I went on my first DXpedition. That was 1958 and I think I'm the only one of the bunch left alive (the others smoked!). It was a fabulous trip for six of us. We went to Nassau in the Bahamas, rented a good sized motor-sailer, and sailed to Navassa. We darned near got killed twice on the trip. Close calls. But that's how you get old—by *not* getting killed. The close calls make great stories, and I've had quite a few of those in my life.

I sure hope you have as much fun with ham radio as I've had for the last 57 years. I'll do all I can with *Radio Fun* to suck you into the more fun aspects of the hobby. That's if you subscribe, of course. But, heck, at only $13 a year, only your "not getting around to it" can stop you. And that would be a shame. Some ham clubs are getting everyone to subscribe. I haven't discouraged that. It provides a monthly shot in the arm. A monthly reminder of the whole world of things you can have fun doing.

With a good signal and a dipole you can have a ball working 75m DX. It's there waiting for you, but you have to have patience. 160m DXing is even tougher, but the harder it is, the more fun you have when you get a new one. Or maybe you'll get interested in setting up your own repeater and making it so the users can work crossband to 6m, 10m, or even the low bands. Why not?

How about making a good directional handheld antenna for foxhunting? None of this sissy car stuff. Set up your hunts so the participants can go on foot and work in teams. Then please write about it for *Radio Fun* or *73.* Also, get someone with a video camera to make a video program I can offer to let other clubs borrow and show at their meetings.

Do a video of your Field Day operation. Or any other special thing that other clubs might like to show at meetings. Clubs are in desperate need of interesting program material, and so are your local TV stations. I'll be glad to act as a central borrowing point, if that'll help. Or you can run a classified ad and rent out your videos for maybe $20 a throw. In that case I'll find someone to review your videos and rate 'em.

I remember years ago when the PhilMont mobile club did films of their better foxhunts. They were great!

What I don't want to see you do is get into a rut and sit and blab night after night to the same old gang. Yes, I've done that too. I talked with Leo W1MLJ, Homer W1KPL, and Bill and Olga W1IF every night for over a year. Then I got busy with 2m mountaintopping and, er, women. But that's another story. A very interesting story. Eat your heart out. Maybe I'll go into that in my memoirs. Heh, heh. RF

# FAR Scholarships

The Washington, DC, based Foundation for Amateur Radio is once again coordinating the distribution of 56 scholarships for the 1995–1996 academic year. Licensed radio amateurs may compete for these awards if they plan to pursue a full-time course of studies beyond high school. Applicants must be accepted for enrollment in an accredited college, university, or technical school. The scholarships range in value from $500 to $2,000 each.

For more information please write to the Foundation for Amateur Radio, 6903 Rhode Island Ave., College Park, MD 20740. *TNX Ham Arundel News, April 1995.*

# SAREX Frequency Changes

Space Shuttle flight STS-71, to be launched in June, is the first to feature a docking between the Shuttle and the Russian *Mir* space station. Special Shuttle Amateur Radio EXperiment (SAREX) voice frequencies will be used.

The special frequencies are: Downlink, 145.84 MHz worldwide; and Uplinks, 144.45 and 144.47 MHz worldwide .

SAREX and *Mir* Amateur Radio stations normally share the same downlink frequency, which would cause interference on the STS-71 mission. Because of this and lessons learned from using particular frequencies during previous SAREX missions, the SAREX Working Group has made these changes for STS-71. The new frequencies were chosen after much deliberation to minimize interference between SAREX, *Mir*, and terrestrial stations.

Most SAREX operations are split frequency, with a downlink (astronauts transmitting to Earth stations) and an uplink (Earth stations transmitting to astronauts). Listen to the downlink and transmit only when the shuttle is in range and astronauts are on the air.

*Mir* operations are simplex and remain on 145.55 MHz.

Before transmitting, listen to the SAREX uplink to avoid interfering with others, and listen for the astronauts' instructions about frequencies they're using. They won't favor a specific uplink, and your ability to work them will be "the luck of the draw."

If these special SAREX frequencies prove acceptable, they will be used for future docking missions. Note, however, that there is a strong chance that STS-70 will fly before STS-71; if so, STS-70 will use the regular SAREX frequencies. *TNX ARRL Space Bulletin 005 ARLS005, April 5, 1995.*

# Aluminum Boots for Your 440 MHz HT

## *(Oh, no, not another J-pole antenna!)*

**by Earl (Jim) Shaffer WB9UWA**

Wait folks! Before you walk away grumbling, "It's all been done before," take a look at an unusual twist on this over-published antenna!

I needed a gain antenna for my 440 MHz HT, but could not find in my vast library any information on building one. I decided I had no choice but to design and build one. Sit down—I'm not going to bore you with a lot of formulas that you're gonna skip over anyway. This antenna design is purely empirical.

The antenna is two half-waves in phase, vertically-polarized, and stacked one above the other. This should provide 2 dB gain over a dipole (or a bunch of dB over the rubber ducky) and is end-fed with a convenient quarter-wave matching section (see Photo A). Notice the simple matching section (see Photos B and C). Instead of the usual stub with a tap, I simply placed the stub section between the antenna and the HT. This will properly match the 50-ohm feed to the high impedance antenna.

### Theory

The secret to the gain of this antenna is the loading coil between the two half-wave sections (see Figure 1). If the loading coil were stretched out, it would be three half-waves, but the middle half-wave section would radiate out of phase with the top and bottom half-waves and cancel some of the radiation. If the loading coil were simply removed, the top and bottom half-waves would be out of phase and cancel at the horizon. The loading coil does radiate out of phase with the top and bottom half-waves, but since it is a coil rather than a straight half-wave, its radiation is reduced to an insignificant level. Just compare a 2" rubber ducky to a 6" quarter-wave antenna if you don't believe me. The loading coil could just as easily be a quarter-wave stub, similar to the infamous Ringo Ranger, but for portable operation I like the compact coil (see Photos C and D). This antenna does not require a ground plane, so you can put it just about any place that you would care to put an antenna.

By now you should have noticed what a clever antenna this is and, while it is great fun to read about antennas, you don't see the need to build this one. You don't really need all that gain for your HT—after all, you can run an eye-popping 6 watts and get into all 30 repeaters in your town of 5,000 people. I don't know about you, but I get a bit nervous about radiating 6 watts of power right into my eyes. The two-half-wave collinear J-pole will do as well on low power as the rubber ducky does on high power. Not only that, but the signal is radiated well overhead and in the clear!

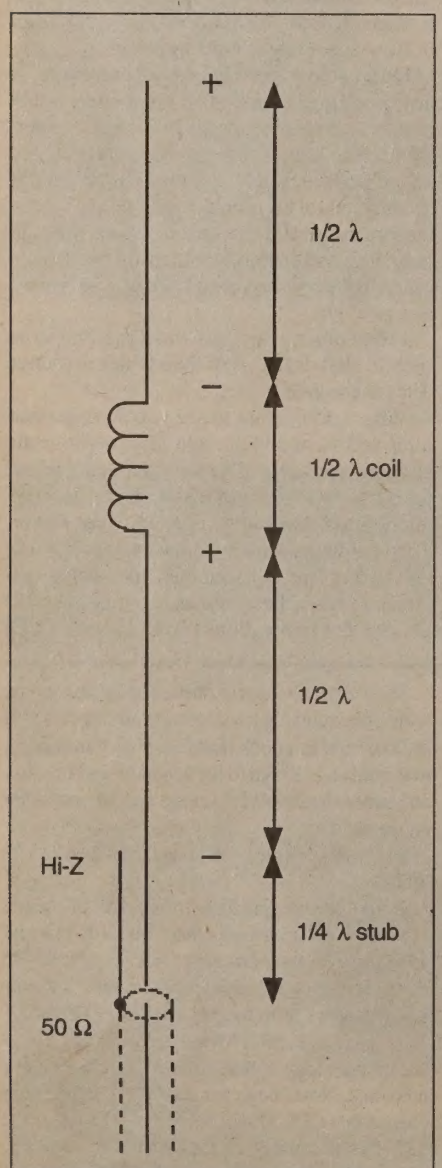



**Figure 1. Electrical drawing.**

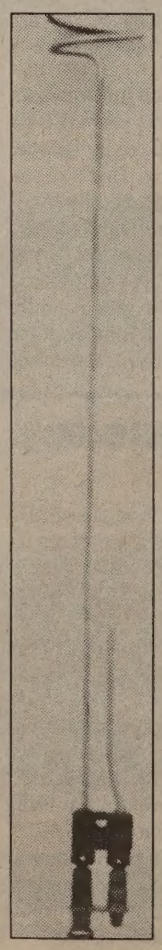


**Photo C. Assembled mounting and matching section.**

### Construction

This antenna is easy to reproduce. The base is simply a Philips PM 9051 BNC-male-to-dual-banana female adapter with a dual-banana plug attached (see Photo B). You should be able to substitute for the adapter, but it may affect the dimensions for tuning. The dual-banana plug is the type that has the larger set screws down inside it. The set screws must be removed.

Reduce the diameter of the ends of the antenna and matching stub so they can be threaded into the plug. The antenna and matching stub are glued at the top of the dual-banana plug. Mine has held for years this way. I used standard 1/8" aluminum clothesline wire. The antenna section is 42" from tip to base plate (all streched out) of the BNC adapter.

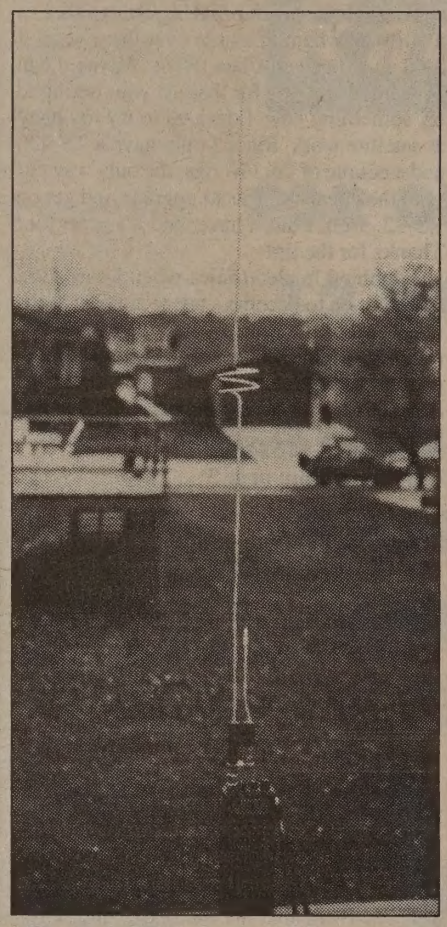


**Photo A. Well-dressed HT wearing "Aluminum Boots."**

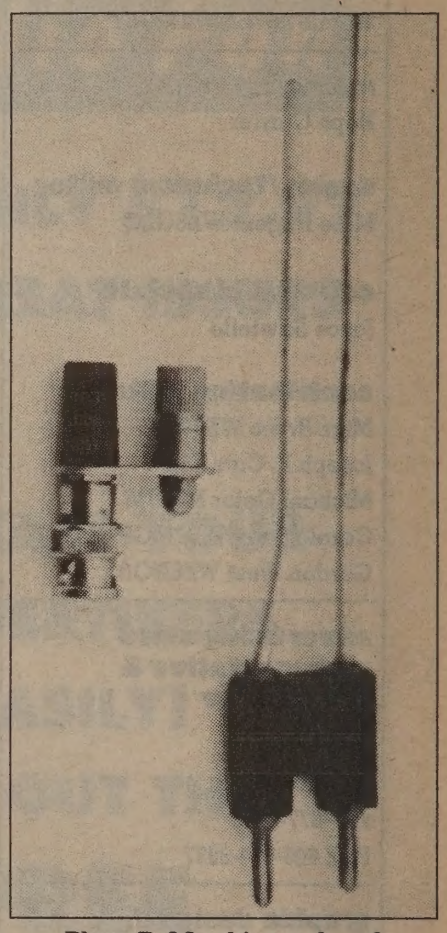


**Photo B. Matching stub and mounting adapters.**

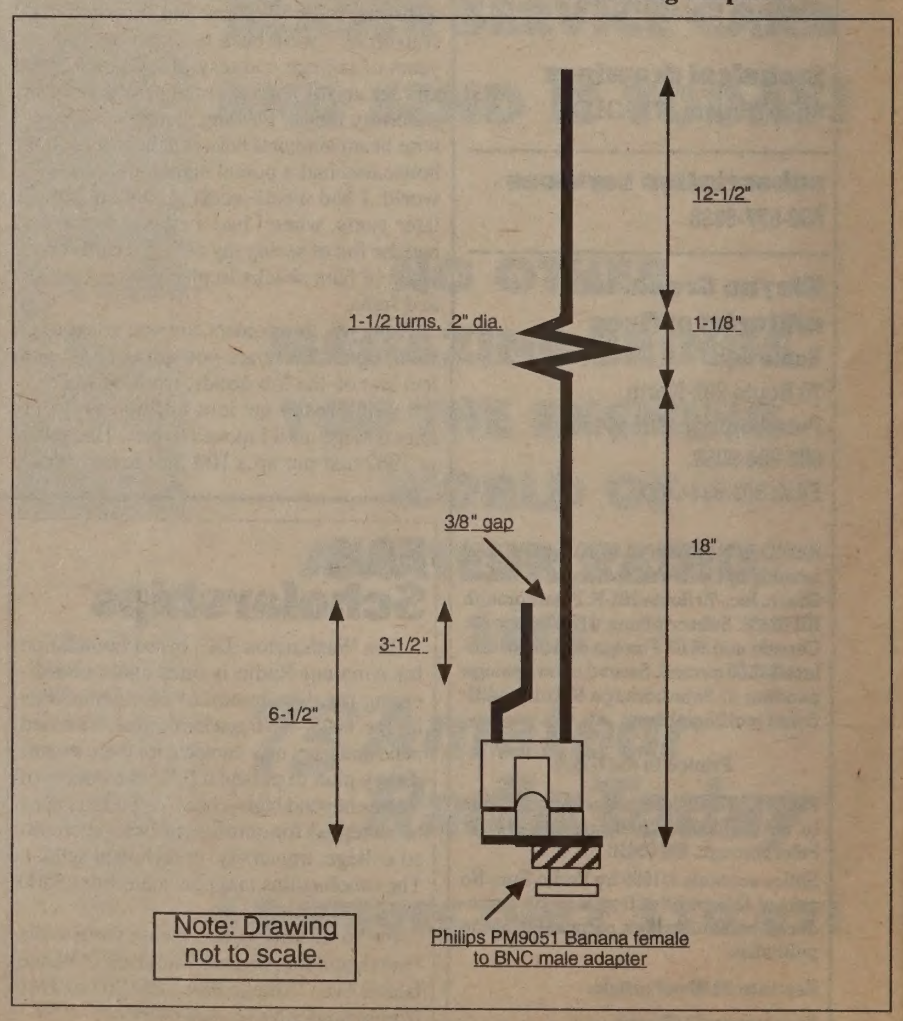



**Figure 2. Construction details.**

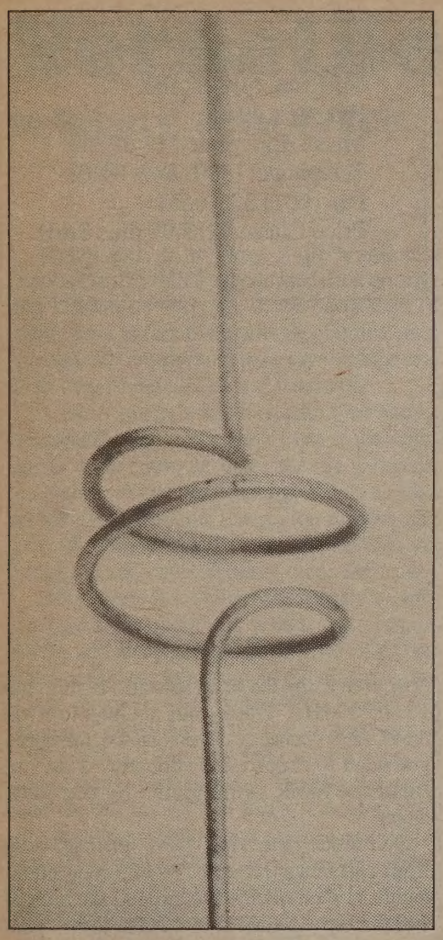


**Photo D. Closeup of the loading coil.**

I would start with the lengths a bit long, install them, then measure and trim them down. The dimensions shown in Figure 2 should be sufficient to duplicate this antenna. It's not real critical, and your final tuning procedure will work out small inaccuracies. The coil is 2" in diameter and 1-1/2 turns. Do not make any sharp bends or you will have to start over. Take the time to use a handy coil form temporarily and make it pretty. You may be using these boots a lot.

### Tuning Procedure

Put a BNC-female-to-UHF-male adapter on your SWR bridge and check the SWR on 442, 446, and 449.995 MHz to determine the resonant frequency. The SWR is probably below 2:1 at this point.

First compress the coil to lower the resonant frequency, or expand the coil to raise the resonant frequency. When the dip is near 446 MHz, while measuring SWR at 446 MHz, change the spacing of the stub to reduce the SWR to 1:1. A double bend of the stub at the dual-banana will keep the stub neat and parallel to the antenna section. Start with the stub at the full spacing of the dual-banana connector. Repeat both steps if necessary. If the coil ends up expanded too much, trim about 1/4" off the top of the antenna and compress the coil a bit. My antenna has a 1.1:1 or less SWR from 430 to 450 MHz.

I have a magnet mount that I connect to the antenna so I can use it mobile. My antenna has survived many trips at highway speeds, but if you would like to see it stand a bit straighter, I would place a good insulator at the open end of the stub. To top off the antenna, I put heat-shrink tubing at the end of the antenna and the end of the stub.

There are some useful variations to this antenna that some of you may want to try. If you cut off the loading coil you will have a simple J-pole antenna that is only 18" long (see Figure 3). If you have a 2 meter quarter-wave whip you may be able to just add the 6-1/2" stub to the ground side of your BNC. I have also used this simple J-pole as the driven element for a small vertically-polarized yagi.

This antenna works. It has provided a 100-mile range during band openings at 6 watts and provides 80% of the coverage that my 25-watt mobile provides, and the gain compares well with my roof-mounted 36" Kenwood dual-band antenna. RF

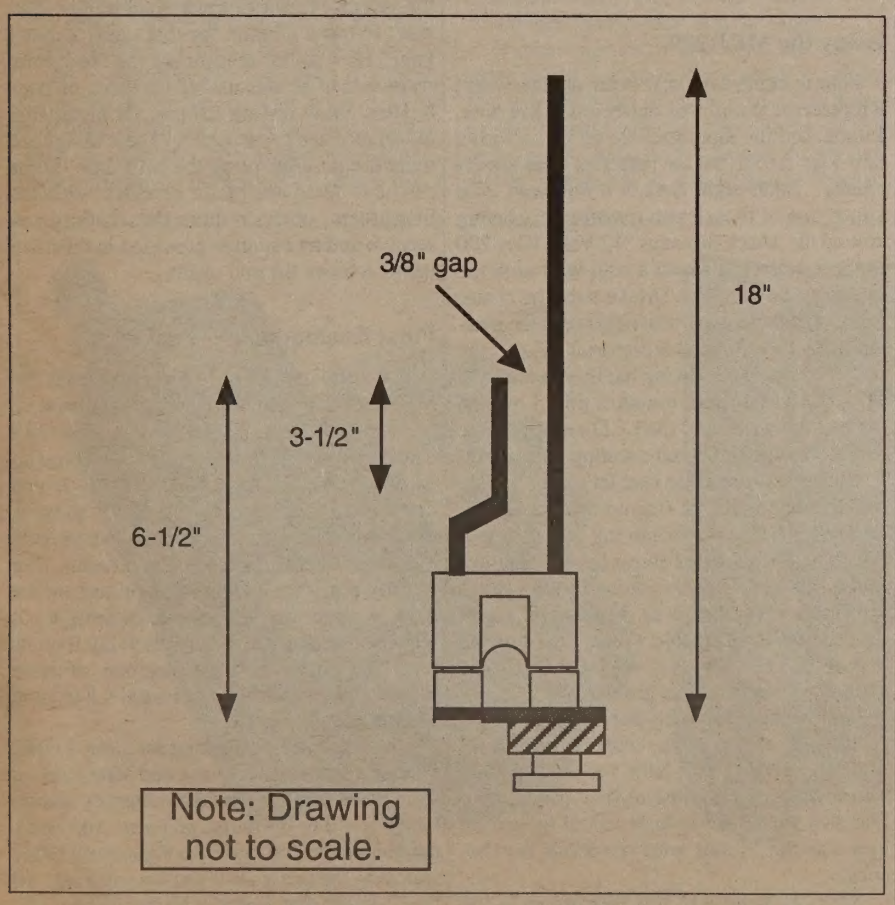



**Figure 3. Modification to make a simple J-pole instead.**

# RF user report

# Ten-Tec 938 Switching Power Supply

Ten-Tec, Inc.
P.O. Box 8010
Sevierville TN 37864
Telephone: (615) 453-7172
Price Class: $95
plus $8 S&H

**by Phil Salas AD5X**

I own a Kenwood TS-50S that I like very much. For portable operation, I've been using a gel-cell battery and a wall transformer for a portable power supply, and this setup has served me very well. However, I do occasionally run out of battery power, especially when I operate above the 10-watt output power level for extended periods of time.

I recently noticed that Ten-Tec is selling a switching power supply for their Scout transceiver. According to the Ten-Tec person I talked to, this power supply is rated at 7 amps continuous and 11 amps peak current. I made a few measurements on my TS-50S and found that it draws about 5 amps peak at 10 watts output, and 10.5 amps peak at 50 watts output. This seemed right along the lines of the power handling capability of the Ten-Tec 938 switching power supply, so I ordered one ($95 + $8 S/H). It arrived about five days later.

It turns out that this power supply is not made by Ten-Tec but is imported from Taiwan by TPS Power Supplies, Inc., and is distributed to dealers by TPS Power Supplies. TPS does not sell directly to the end user; i.e., you must go through a TPS dealer (Ten-Tec in this case). In any case, this power supply is the TPS PS-11 (Ten-Tec 938) switching power supply.

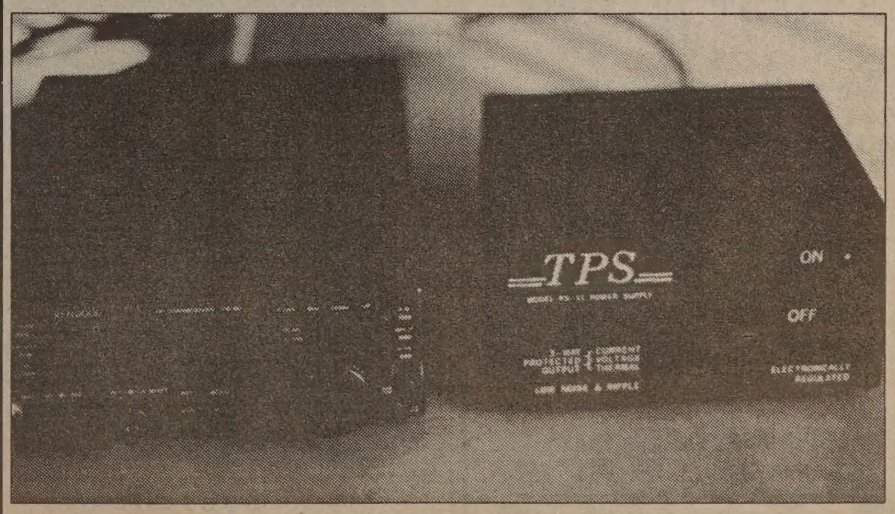
### It's Great!

What's so great about this power supply? Well, it is tiny (5.5" x 6" x 3.5") and very lightweight (2.5 pounds)! It is perfect for carrying around for portable operation. And, it actually is a little heavier-duty than Ten-Tec said. This power supply provides 11 amps continuous and 12.5 amps maximum. It has over-voltage, over-current, and high temperature protection. It also has 1/2% load regulation (no load to full load) and 15 millivolt maximum ripple at full load. Finally, the efficiency is typically 80% (compared to less than 60% for most linear power supplies).

So how does it work? Great. I've used this supply with my TS-50S for extended periods of time on both CW and SSB. There is no noticeable heat generated by this supply during operation. And the supply is small and lightweight and can be easily thrown into a briefcase along with a TS-50S to go anywhere.

Finally, if you want to run the full 20 amps for a full 100 watts output, TPS says you can simply connect two of these supplies in parallel and they will load-share. Two of these supplies are still much smaller than the average 20-amp linear supply and cost in total about what a Kenwood, Yaesu, Icom, etc., matching 20-amp power supply normally costs. Or you can do like I do and just hang a 12 V 6 Ah gel-cell across the output of a single PS-11 for full 100-watt output operation!

If you are looking for a small, lightweight power supply for portable operation, take a look at the Ten-Tec 938 switching power supply. It's tough to beat. RF




**The Ten-Tec 938 switching power supply.**

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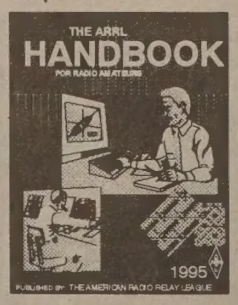


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# RF user report

MFJ Enterprises, Inc.
P.O. Box 494
Mississippi State MS 39762
Telephone: (800) 647-1800;
Fax (601) 323-6551
Price Class: $219.95 plus S&H

# The MFJ-249 SWR Analyzer

**James E. Haney NØLZS**

For years I've been pruning antennas, climbing up on roofs, up towers, hanging out of trees, and otherwise putting my health at risk in trying to find that elusive 1:1 SWR match on my newest dipole, yagi, (insert the appropriate antenna name). Not only did I do these things once, mind you, but in most of these antenna pruning/adjusting sessions I found myself making several trips to my perch to adjust or prune, only to return to the station and find that one of two things had happened: The SWR did not change at all, or it was much worse than before.

I know all you rocket scientists are going to jump on me and load my wagon with 10 different formulas for figuring the length of a wire antenna, an insulated element versus a non-insulated boom mount 30 feet off the ground. Stow it. I've been there and have read those same equations. I'm talking practical, "real world," where things don't tend to resonate like they do in the book, and I'm trying to save you a few trips up on the roof, tower, (insert your destination). So shut up and read.

## The Solution

Anyway, before you interrupted ...

This gadget from MFJ is a godsend if you play with or adjust antennas. The item is known as the MFJ HF/VHF SWR Analyzer, and it does do that, and very well, thank you. The one I went into hock for is the MFJ-249, which functions in the frequencies of 1.8 through 170 MHZ.

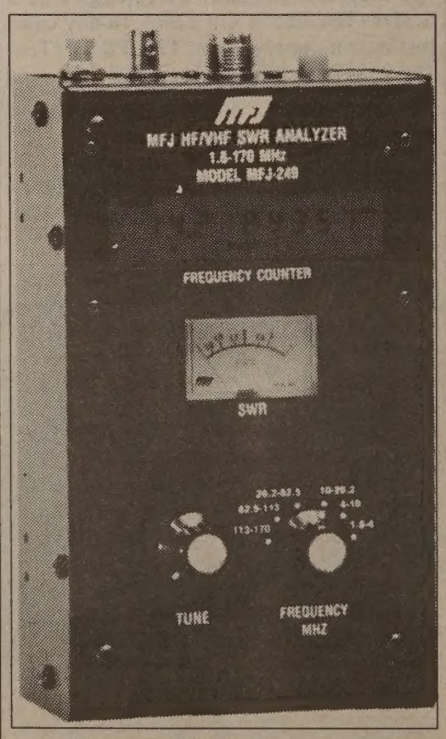



**Photo A. The MFJ-249 SWR Analyzer.**

You, yeah you, reading the *73* on the john, your question first. "How did it work"? Well ... it didn't at first. Yep, there was a problem. So I called the Major Amateur Supplier from whom I'd bought it. (Psst, Wayne, I didn't see an ad from them in *73* so I'm not going to plug them, heh heh.) "Send it back," they said. Hey, I live out here where they have to pump daylight to me. I have to pay the freight? Yep. @#$%!

You should definitely read statement number 4 of the MFJ warranty on the back of the owner's manual prior to this undertaking. Let me quote it to you: "This warranty is *not* void for owners who attempt to repair defective units. Technical consultation is available by calling (601) 323-5869." Can you believe that? (Hon, get me that Phillips screwdriver!)

Nonetheless, I packed it up (sans manual—it's got a really good picture of the MFJ-249 on the front cover, and I figured I could at least set *that* on my workbench) and sent it off.

## Using the MFJ-249

Four working days later (read: about a week) a replacement unit was delivered to my door. I unpacked the unit, and like all of us with a new toy, found that the batteries were *not included.* Takes eight AAs or a wall wart (you know, one of those extra transformers laying around the shack that says "12 Volt DC at 200 mA" or better). I found a wall wart with the matching power plug. (Make sure the center is "+." For those of us who never read the manual, they have placed a pictorial next to the power receptacle showing the tip orientation.) With the transformer transforming, I pushed the power switch and the LCD readout came to life, the counter started counting ... *it works!*

Unplug an antenna to test; let's see ... yeah, the homemade J-pole (from an article in *73,* no less!). I've always had my doubts about this thing—it's located above the TV antenna, up on this very steeply pitched roof. Yes, I remember several trips up there trying to get the darn SWR acceptable. (What? Do it on the ground? Take the easy way out? It's the challenges that make us grow!)

Look at this, Hon. The darn thing resonates pretty well at 146 MHz, center of the band! Indicated SWR, 1.7:1. Now I'm really getting into this. Let's get some of that graph paper like they showed us in high school (how long ago was that?) and plot the SWR for this sucker.

Now, the beauty of this instrument is the frequency counter. You set the frequency of operation using the band selector, in this case 113-170 MHz. Hook your antenna to it via the SO-239 connector. Then dial the frequency you want to check on the counter. That's it! Read the SWR as indicated by the SWR meter.

So I plotted the SWR curve for that J-pole from 130 megs through 175 in 5-meg increments. I then decided to expand the area of 140 through 150 MHz in 1 MHz steps. And then I tried the unit on a five-element 2 meter beam located on my tower. I found that several winters have not been kind to that antenna—the lowest reading I could obtain was 2.5:1. I will no longer transmit on that antenna until some maintenance can be performed. My ThunderBird Jr. checked out exactly as I had remembered when I installed it.

## The Manual

The manual is 18 pages, well organized, and provides some very good information on using the MFJ-249 to perform various tests. These tests include, but are not limited to, checking the velocity factor of transmission lines. You want to build a balun for that latest 2 meter yagi? How about measuring the feed point resistance of an antenna? It's in there, on page 8. How about testing baluns? Or measuring inductance and capacitance? These things and more are possible using the MFJ-249. Some of these tests are made directly with the instrument; others require the reading you receive and an equation provided in the manual to achieve the end result.

## Final Evaluation

Bottom line: Would I recommend the MFJ-249? You betcha. And that statement on the warranty just makes my day. Would I change anything? Well, maybe. The frequency counter is not rock-solid stable. If you dial up 145.090 to check your packet antenna, the display may vary a couple hundred hertz either side and flicker back and forth. I've already put some rubber stick-on feet on the base of mine; that way it can sit upright. It already comes with rubber feet to lay it on its back. I would also like to see one of those little wire bails on the back to allow it to sit at a better viewing angle.

Overall, if you are looking for a way to take an instrument to the antenna, and obtain a good solid SWR indication for the frequency around which you'll be operating, *go for it!* And here's the good part: You make the adjustment while watching the meter until you are satisfied! All this, I might add, without transmitting a single beep to sully the ether. RF

# Versatile Grid-Dipper

**by Robert C. Green W3RZD**

Today there is an array of electronic test equipment that fulfills all our needs and dreams, but it wasn't always so. In the early days of radio, long before the word "electronics" was coined, test equipment was very scarce and also very limited in what it would do.

A radio amateur was fortunate if he had an ohmmeter and a voltmeter, even if the ohmmeter wasn't very accurate and the voltmeter loaded the circuit enough to give only an idea of the actual voltage. Due to the scarcity and cost of commercially made test equipment, amateurs and experimenters made their own.

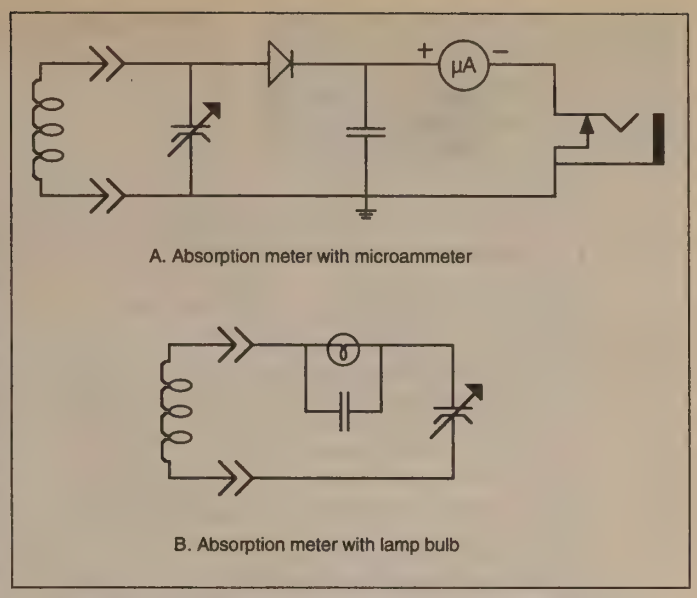
Homemade test equipment usually included a grid-dip oscillator, which was called a GDO, and an absorption meter. The GDO was used to find the frequency of circuits in homemade receivers and transmitters. A carefully built and calibrated GDO had an accuracy of 3%, which is a long way from what is expected in a modern digital meter. Despite the years and the test equipment that's now available, the absorption meter and grid-dip oscillator are still around and being used. Photo A shows a modern version of a combination GDO and absorption meter.

Basically, both instruments have a tuned circuit that can be varied over a range of frequencies, and a microammeter to indicate a circuit condition. But here the similarity ends. The major difference is that an absorption meter will absorb power from a circuit, and a circuit will absorb power from a GDO.

## Absorption Meters

An absorption meter is a parallel-tuned circuit consisting of a coil, a variable capacitor with a calibrated dial, and a sensitive indicator. The indicator can be a microammeter or a low-voltage low-current lamp bulb, such as a #48 flashlight bulb. An absorption meter will only absorb power from an oscillating circuit if both are tuned to the same frequency. When power is absorbed there will be a *rise* in the current shown on the microammeter, or in the brightness of the bulb. At peak current the frequency is read from the dial on the variable capacitor. However, the frequency shown *is not* the frequency of the tuned circuit, but the *frequency of the current* flowing in the circuit.

The absorption meter *is not an oscillator,* only a tuned circuit. An accuracy of about 10% can be expected if a microammeter is used, but if a lamp bulb is used the error will be greater due to the difficulty in determining the brightness peak. Figures 1A and 1B show both types of absorption meters.




A. Absorption meter with microammeter

B. Absorption meter with lamp bulb

**Figure 1. A) Absorption meter with microammeter; B) Absorption meter with lamp bulb.**

## Grid-Dip Oscillators

The GDO *is a low-power oscillator* and is used to find the frequency of a resonant circuit. But the resonant circuit does not have to be a coil/capacitor combination—it can be anything electrical that has resonant properties. The GDO received its name from the change that occurs in the current flowing in the control grid of the vacuum tube powering it. A vacuum tube GDO circuit is shown in Figure 2. Perhaps it would be easier to understand the operation of a GDO if we review a little bit of vacuum tube theory.

***"An absorption meter will absorb power from a circuit, and a circuit will absorb power from a GDO."***

The basic vacuum tube is called a triode because it consists of three elements: a filament, a grid, and a plate. See Figure 3 for a top view of a triode. The filament is in the shape of a hairpin or an "M," and is mounted in the center of the tube. The filament is connected to a low-voltage source, which heats it to a temperature that causes electrons to be emitted. Electrons have a negative charge, so they are attracted to the plate, which has a positive voltage supplied by an external source. The flow of electrons to the plate has to pass through the grid, which is between the filament and the plate.

In most vacuum tubes there is another element, called a cathode. The cathode is a sleeve that surrounds the filament, and when heated by the filament will emit more electrons than the filament can by itself. Electrically, the cathode is connected to ground and is negative with respect to the grid and plate. The tube is still called a triode, because the cathode has become the major emitter of electrons instead of the filament.

The grid, which resembles a mesh or screen, is used to vary the number of electrons striking the plate, thus controlling the current in the plate circuit. The grid is connected to an input, which could be the output of an amplifier or a tuned circuit.

The voltage on the control grid becomes alternately more positive and more negative due to the input signal. On the positive half of each input cycle the grid will capture some of the electrons traveling to the plate, and a small direct current will flow to the external grid circuit. This current flows through the grid resistor and back to the cathode. In the GDO a microammeter is included as part of the grid circuit.

The grid current in a GDO will remain constant as long as the frequency of the input circuit remains the same and the GDO is kept at a fixed distance from another circuit. However, if the GDO is moved closer to another circuit that is tuned to the same frequency, the microammeter will show a sudden *dip* as power is absorbed from the GDO. Thus the term "grid-dip oscillator."

## Today's GDOs

Today, a GDO uses a transistor instead of a tube, and this necessitates a different circuit. This is because there isn't a current flow in a transistor that acts the same as the grid current in a tube. Figure 4 shows a transistorized GDO circuit. A field-effect transistor (FET) is used in place of a bipolar transistor, as its operation is more consistent with that of a vacuum tube. One similarity is that an FET has a high input impedance, as does a tube. Even though the circuit is transistorized, the end results are the same, and it is still referred to as a grid-dip oscillator.

The GDO shown in Photo A is a tube model, and had an internal power supply. A transistorized version would be about the same size, 7" long, 3" high and 2-1/2" wide, and would contain the required batteries.

A GDO will normally cover a frequency range of 1.5 to 250 MHz by using a series of plug-in coils, the number depending on the electrical size of the variable capacitor. Frequencies lower than 1.5 MHz can be covered if specially wound coils are used. However, for frequencies above 250 MHz, a vastly different type circuit is needed.

## Coils

The low-frequency coils, those from 1.5 MHz to about 100 MHz, are wound on a form that resembles a plastic pill bottle with two or

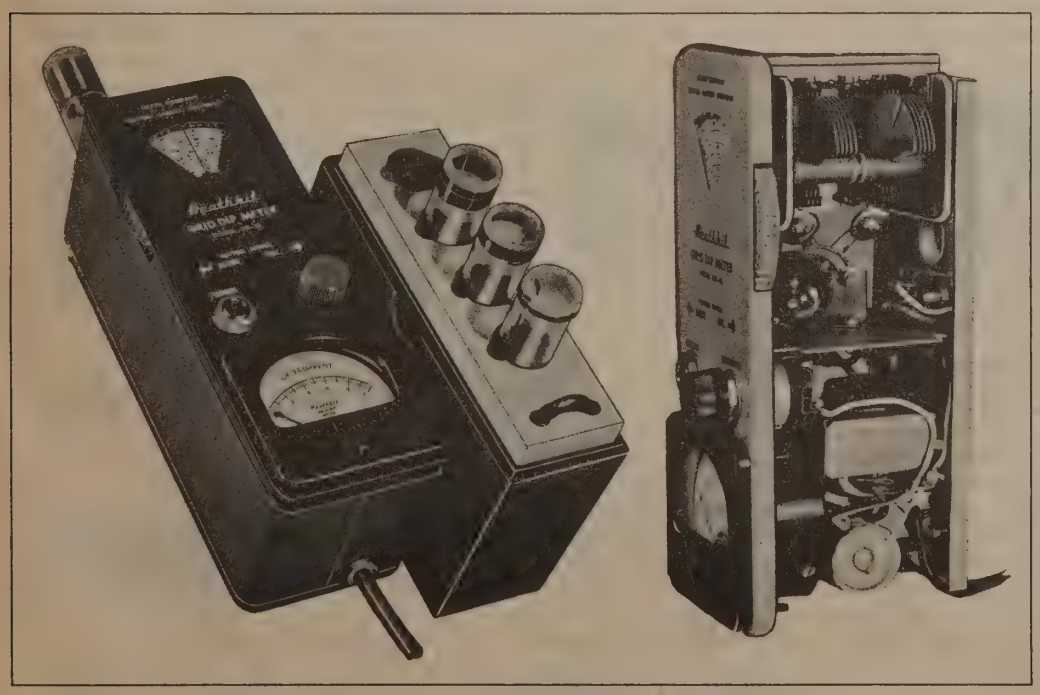


**Photo A. Tube-type combination GDO/absorption meter.**

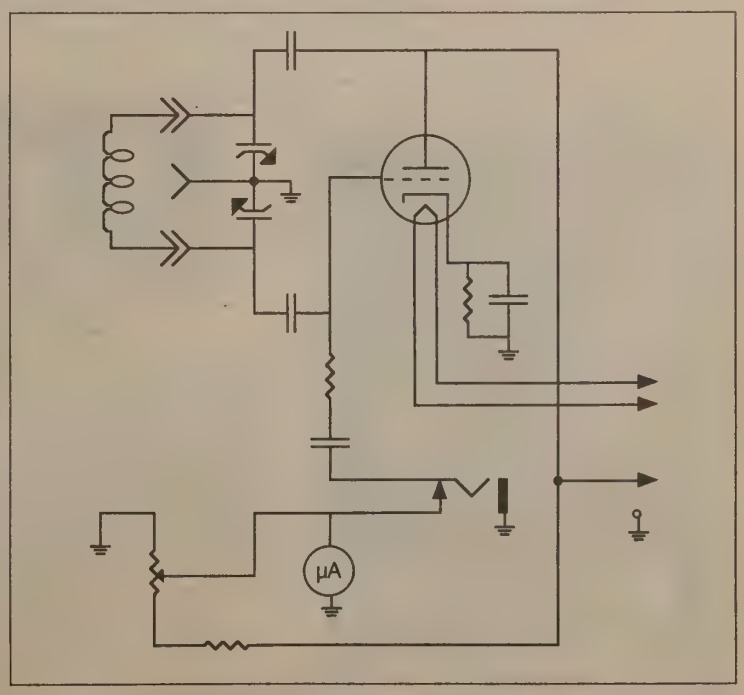



**Figure 2. Tube-type grid-dipper.**

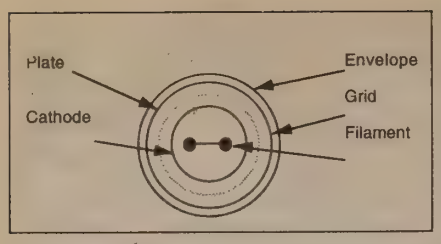



**Figure 3. Top view of vacuum tube.**

three pins on the bottom. The coil that covers 100 to 250 MHz is made of heavy gauge bare wire and is self-supporting. This coil is usually a half-turn bent in the shape of a hairpin and has pin-shaped ends. Practically all GDOs, whether vacuum tube or transistor type, use a Colpitts oscillator circuit, which requires only a two-pin coil. However, the coils for below 1.5 MHz have a three-pin base, as a coil tap is connected to ground through the third pin.

The coil must be kept external to the case so it can be used as a probe, and this has resulted in two styles of GDOs. The first style has the coil plugged into a socket on the end of a short cable connected to the case; the second has the coil plugged into a socket mounted on the end of the case. The first requires two hands to operate, one hand for tuning and the other to hold the cable. The second style, such as that shown in Photo A, allows one-handed operation.

One-handed operation is possible when the GDO is cradled in the palm of the hand, which leaves the thumb free to rotate the edge of the dial. As shown in the photo, the edge of the dial projects over the sides of the case. The large size of the dial, plus a reduction gear on the shaft of the capacitor, provide for easy and smooth tuning.

### Other Features and Uses

Some of the other features of the GDO pictured include: an earphone jack for listening for a zero beat between the GDO and an energized circuit, or as an audio monitor; a sensitivity control to reset the position of the microammeter needle to a convenient level, as the needle position will change when the capacitor is tuned; and a switch on the bottom of the case which permits operation as a GDO or an absorption meter. The switch position is marked by the words "DIODE" and "OSC," printed on the top panel. In the "DIODE" position the circuit becomes an absorption meter as the switch removes the voltage from the plate of the tube, thus transforming it into a diode. With the switch in the "OSC" position the circuit functions as a GDO.

A GDO is a versatile piece of test gear. A few of its many uses are: finding the resonant frequency of a coil/capacitor combination; searching out parasitic oscillations; determining if a transmission line is cut to the proper length; tuning an antenna; checking the resonant frequency of a RF choke; and serving as a signal or marker generator.

### Coupling

When a GDO is to be used for any of the above it has to be "coupled" to what is being checked. Coupling is when two circuits or pieces of equipment are close enough for one to absorb power from the other when both circuits are tuned to the same frequency. When the coupling is too tight or too close, the microammeter will show a very deep and wide dip at resonance, making it difficult to determine the exact point. When the coupling is too loose (that is, if the GDO is farther away), the dip will be very shallow, also making it difficult to determine a minimum point. The correct distance is where the needle dip is sudden and pronounced.

There are two methods of coupling: inductive and capacitive. Inductive is the most common. However, circuits with a very high "Q" should be capacitively coupled. Q is a figure of merit of an inductor or a capacitor, or a resonant circuit. The higher the Q, the sharper the resonant peak.

Inductive coupling occurs when the turns of wire on the GDO coil are parallel to the turns on the coil being checked. When the turns of the two coils are at a 90-degree angle, the coils are capacitively coupled. Figure 5 shows an example of each.

### For More Information

Through the years, several books have been written about grid-dip oscillators, but they are now out of print. However, there is always a chance that a copy can be found in your local library or a used-book store. One book is *How To Use Grid-Dip Oscillators,* written by Rufus P. Turner, and published by Rider Publications in 1960. Information can also be found in editions of *The Radio Handbook* published by Editors and Engineers during the 1950s, and in older editions of *The Radio Amateur Handbook* published by the ARRL between 1960 and 1980.

### Suggestions for Purchasing GDOs

If you decide to purchase a GDO, there are still a few test equipment manufacturers who make them, but they are few and far between. A new or used GDO may be available from an amateur radio supply store in your area, or contact one of the used-equipment dealers listed in *Radio Fun* and *73* magazines. Write to them for a list of used test equipment—it's amazing what they sometimes have to offer.

Don't overlook the possibility of buying a GDO at a hamfest. If you decide to go the hamfest route, here are a couple of suggestions: Take along a pocket AM-FM transistor radio so you can check the GDO on the high and low ends. If you find a GDO, look it over carefully for signs of abuse. If it has been beat up, don't buy it unless it's cheap and you think you can repair it. Also check the smoothness of the tuning dial. If it scrapes or is rough, it could indicate one of two things, or even both: bent plates in the variable capacitor or dirt in the shaft bearings. Be sure all the coils are included, and the instruction manual as well. If the only model you find is a vacuum tube type, buy it, but while at the hamfest look for a dealer who is selling tubes and try to get one or two spares. You may never need them but it is better to be safe than sorry. A hamfest would also be a good place to look for any of the books mentioned above. RF

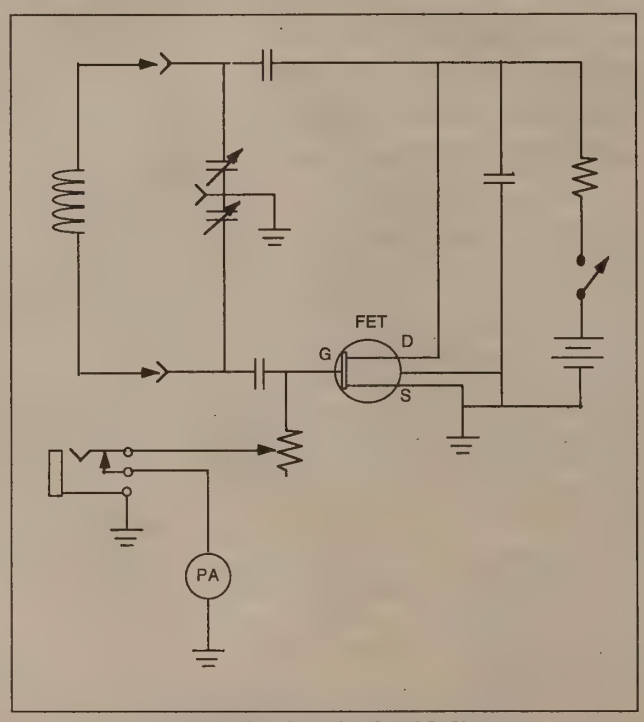



**Figure 4. Tansistorized grid-dipper.**

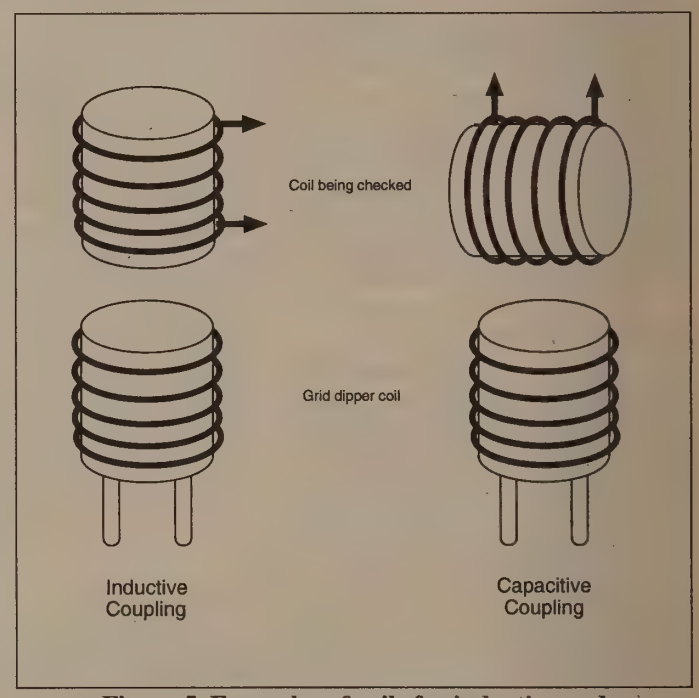



**Figure 5. Examples of coils for inductive and capacitive coupling.**

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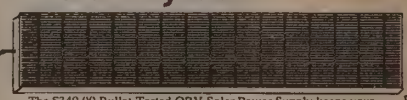

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# Tape-Record Your QSO

**by Robert C. Green W3RZD**

In the early 1950s, which seems like a long time ago, a lot of hams started to tape record their contacts. I was one of them, and recorded not only the good guys and gals but also the "electronic experts," and the weirdos who boasted about how much they had spent on their equipment. I remember one contact (and I am not joking when I say this) who even bragged about how many pliers, screwdrivers, soldering irons, and so on, he owned. I don't know why, but right in the middle of that delightful QSO I suddenly lost contact with this charming individual. I guess atmospheric conditions must have changed. Anyway, it saved tape for another QSO.

When I say "long ago" I mean in the days of "steam-driven" AM transmitters, and receivers that had 15 to 20 tubes. At that time there were no cassette tape recorders, only reel-to-reel machines with 1/4" tape. Some of the hook-ups we used then can still be used with today's transceivers and cassette recorders.

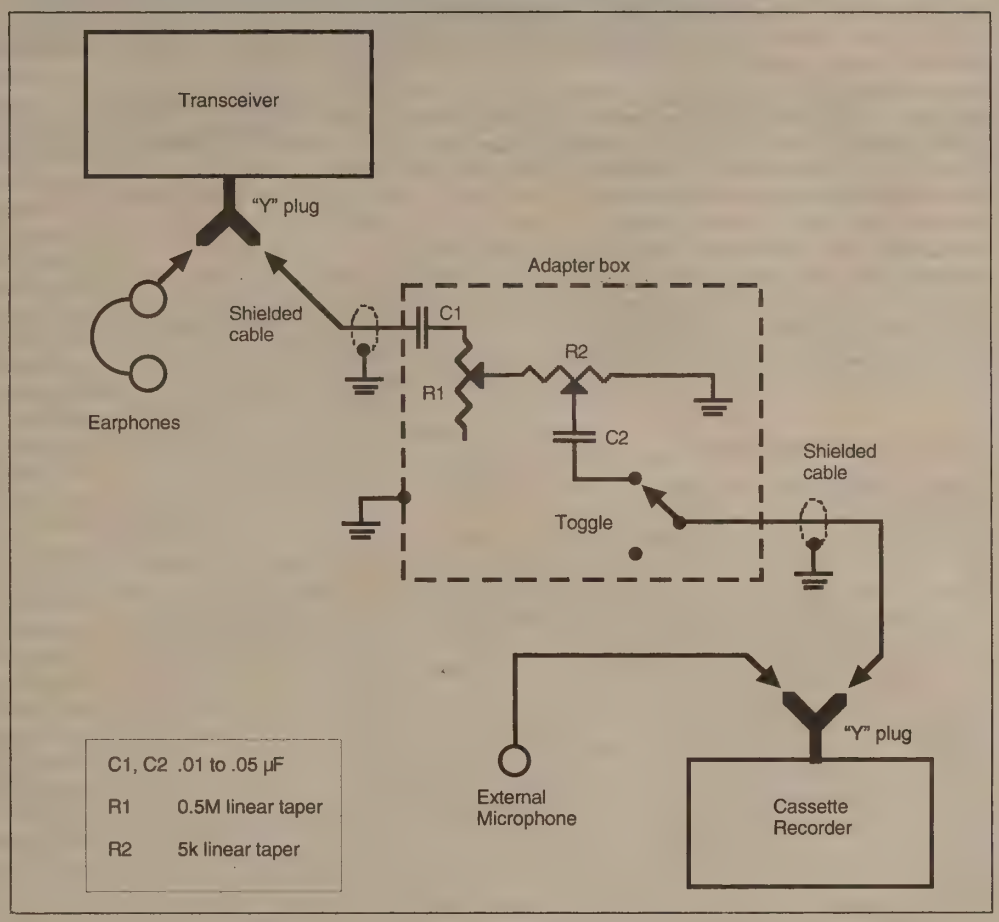


**Figure 1. Adapter circuit to record your QSOs.**

## The Old Method

Normally, the recorder's microphone was placed near the transmitter's microphone so it would pick up the voice of the operator as well as anything coming out of the receiver's loudspeaker. However, there were two drawbacks to this lash-up: The recorder picked up all the background noise in the room, but so did the transmitter's microphone; and, when it was necessary to use earphones for receiving, the recorder didn't get any signal from the loudspeaker.

That meant another scheme had to be used so the recorder could pick up both the loudspeaker and the earphone signal without doing a lot of fancy plug-switching. Sometimes the earphone signal could be fed into the "auxiliary input." However, on some recorders, when the auxiliary input was used it disconnected the microphone jack, and the microphone had to be used to pick up the operator's voice. So, the only way it could be done was to use the microphone jack for both inputs.

An adapter was made that plugged into the receiver's earphone jack to keep the earphone level normal but still provide a signal at microphone level for the recorder. This same type of an adapter can be used with a cassette recorder and a transceiver.

## Adaptations for Today's Cassette Recorders

Actually, a cassette recorder is ideally suited for this job, as just about all of them have an "Automatic Level Control" (ALC) that keeps the microphone circuit level constant. So, if the microphone signal is low the ALC will boost it, and if the earphone signal is too high the ALC will reduce it.

But don't forget that you will have to use an external microphone in place of the recorder's built-in microphone. Just as with the auxiliary jack, the built-in microphone will be disabled when an external microphone is connected.

See Figure 1 for the adapter circuit. The earphone signal is split at the earphone jack so that one feed goes to the earphones and the other feed goes to the adapter and on to the recorder. The signal in the adapter is reduced by the combination of R1 and R2 to microphone level, with R2 acting as a fine-tuning control. R1, which is mounted inside the box, has a short shaft with a slot on the end so it can be adjusted by a screwdriver through a hole in the box. R2 and the toggle switch are mounted to the top of the box so they can be reached. Normally, R1 will not have to be reset once a satisfactory input level for the recorder is reached. The toggle switch is closed for earphone operation.

Because the output is different for each make of transceiver, and each operator likes a different level of volume in the earphones, it would be wise to breadboard the circuit to find the correct values before any parts are mounted inside the mini-box. The values given for R1 and R2 are only suggested values, but they were used in one adapter. Both potentiometers should have a linear taper, as they will be easier to set than those with audio tapers. A fixed-value resistor can be substituted for R1, but R2 should be set to the middle of its range when picking the resistor. The capacitors are used to isolate the adapter.

The other parts required are two audio "Y" plugs, two short shielded cables, and two phono plugs. The "Y"s are the kind used to connect two pairs of earphones to one jack. The earphone jack on the transceiver is probably a 1/4" size, and the plug on the earphones is also probably a 1/4" size, so one "Y" should have two 1/4" female jacks and a 1/4" male plug. The other "Y" is used at the recorder, and this "Y" will probably need two 1/8" jacks and an 1/8" plug; the plug size depends on the size of the microphone's input jack. An inexpensive microphone can be used to pick up the sound from the loudspeaker and the operator, and most of them have an 1/8" plug. Hence, the jacks on the "Y" can be 1/8". But before buying any of the "Y" plugs, make sure what sizes are needed.

If you have to buy a microphone, try to get one that has a desk stand to prevent it from rolling around. Most of the inexpensive cassette microphones have an "OFF-ON" switch on the handle, which controls the recorder's motor. The cable terminates in a two-prong plug: The large prong is the microphone output, and the thinner prong is connected to the switch. The switch will not be used, so this prong on the plug can be cut off. If you get a microphone with this type of plug make sure there is clearance on the recorder's "Y" for the plug from the adapter box. It may be necessary to remove the two-prong plug and install a separate 1/8" plug.

## Operation

Operation of the adapter is simple. First of all, keep the adapter plugged into the recorder at all times. When earphone operation is required, plug the adapter into the earphone jack on the transceiver and close the toggle switch. For loudspeaker operation, unplug the adapter from the transceiver and open the toggle switch to prevent any loss of signal from the recorder's microphone through R2 and R1.

If you are an audio fanatic, your junk box may contain all the parts to make the adapter. If that is the case, try this type of recording for a change. I think you'll like it. RF


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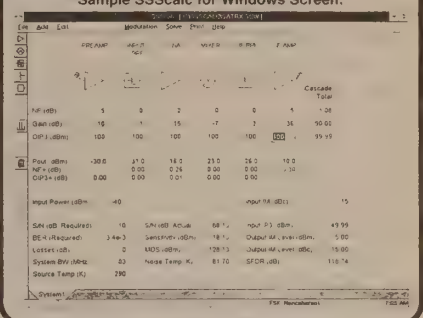

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# Cross-Country Operating

**by Arthur R. Lee WF6P**

Have you ever wanted to set up a mobile QTH while vacationing? It's easy, inexpensive and fun. These tips can help you get on the air without ruining the family budget.

When my wife, AB6XJ, and I decided to make our biannual cross-country trip this year to the East Coast from California, we regretted shutting down the ham shack for three months. We would be towing a 22' travel trailer, first to San Diego, then to Maine.

Our daughter and son-in-law had recently obtained their Novice licenses, as had our son in Maine. We were operating daily schedules on 40 meter CW with several hams and wanted to stay in contact. We were also trying to keep in contact with friends aboard the yacht *Rouser* near Tahiti. This would be over the Pacific Maritime Net, 21.404 MHz.

Another of our contacts was a ham friend of some four years who lived in the Caddo Mountains of Arkansas. We had never met but planned to do so enroute. We also wanted to keep in contact with several local club members who would relay messages to our other daughter, who was house-sitting for us.

## Putting Together the Equipment

We had just purchased a new Icom 730. It is a lightweight and portable rig and seemed ideal for use in the trailer. We could not afford the time nor money to purchase a commercial mobile fold-over antenna, so our antenna was to be a quickly-constructed dipole.

Despite the fact that the trip had been planned for a year, last-minute preparations seemed to pile up and my antenna still had not been constructed. To prevent delaying the trip, I quickly threw together an electrical junk box, complete with spare coax, lots of wire, terminals, tools and a multimeter. To prevent damage, and for ease of handling, the rig was left in the original packing boxes.

Our first stop was San Diego, where we visited our daughter Joyce KN6RR and her husband Preston N6ODW. There, we made a trip to the local hardware store and purchased three sections of aluminum tubing. The largest tube was 8' in length and 1" in diameter. The other two tubes were 6' in length and each was 1/8" smaller than the other, permitting the tubes to telescope a short distance inside each other. Next, we cut 15 and 40 meter dipole antennas to the proper length for the frequencies to be used. A commercial connector was used at the apex of the antenna, and egg insulators were used at the end of each leg of wire. The tubes were drilled to accept 10-32 bolts and nuts to hold them in position when extended. The ground wire was 30 feet of spare #14 wire found in the junk box. In anticipation of making numerous ground connections, I purchased an easily detachable water pipe ground clamp. This was to prove, later, to be very convenient. The lengths of aluminum tubing for the mast fit inside my camper shell in the pickup bed. With fingers crossed, we loaded the untested antenna into the camper and headed east.

## Setting Up and Operating

Our first opportunity to set up the rig was in Tucumcari, New Mexico, where we stayed at a private trailer park. As in many parks, the choice of parking was limited. Unfortunately, the only space available was directly under the biggest electrical power line and transformer I had ever seen. While we were debating whether or not to set up the antenna, it began to rain. Then, a violent lightning storm struck. Lightning knocked out all power in the town and treated us to one of nature's most spectacular displays. There was no hamming that night.

Our earliest *real* opportunity to set the rig up was near Henrietta, Oklahoma. We parked in a broad open area with sufficient room to set out the 40 meter dipole. While my wife was making dinner, I rigged the telescoping tubes. The first problem was that all of my bolts had shaken out and were lost somewhere in the bed of the camper among our boxes of gear. Luckily, spare cotter pins in my tool box fit well enough to do the same job.

The dual antenna was fitted to the end of the smallest of the tubes and each section locked in place. When I attempted to erect the 20-foot antenna alongside the trailer I found that the weight of the antenna and center insulator, combined with the weight of the coax, caused greater flexibility of the tubing than I had anticipated. Once in position, the vertical mast was sturdy enough, but I had to be careful to lead the coax directly down the mast. The mast was tied to the awning brackets on the trailer, giving the antenna a total height of about 24 feet.

Next, the two legs of each dipole had to be spread out and anchored. I used nylon cord for this and staked the ends out, using four screwdrivers pushed down into the soil.

The trailer window screen was pulled away from the frame, and both the ground wire and coax were passed through. When the frame screws were tightened, the screen fit well enough to keep out flying insects.

Inside the trailer, the most convenient location for the rig was the dining table. The table was large enough and the rig could be left set up without interfering with meals or after-dinner reading or writing activities. For a more permanent installation, I would prefer a radio shelf somewhere closer to the ceiling, over the dining table.

I did not need a tuner for the scheduled frequencies but did use one for broader tuning and working more contacts. One of my main concerns was that I would interfere with TV sets being used by adjacent motor homes and trailers. TVI was never reported at any of the operating sites, although TV antennas were very close to our dipole. So as not to disturb our neighbors, we kept the audio gain low and used earphones at night.

Setting the antenna up in some parks presented a considerable challenge. Whenever possible, we sought out parking space on the open perimeters of parks. These spaces were often unfilled, as most travelers prefer to park near the bath and recreation areas. The main disadvantage to being farther away from other campers was that in some desert or isolated areas we were concerned about the presence of venomous snakes. For this reason, we were very careful about stepping out of the trailer at night or the first thing in the morning. Parking in the back areas of campgrounds did provide us the area we needed for the full length of the antenna. The antenna for 40 meters is 66 feet, plus another 10 feet at each end for the guy lines and stakes. Many times, however, the closeness of other trailers, tents, high tension lines, access roads in and out of the parks, and oddly positioned buildings or trees made the antenna location and direction a matter of chance. Often, people near us simply slept on the ground in sleeping bags. We took care that our guy lines did not present a tripping hazard for those campers who had to walk through our site.

One of our most memorable and exciting stops was in little-known Caddo Gap, Arkansas. There, we spent a wonderful three days and two nights with my old on-the-air friend Rod. We were treated to some good old ham hospitality and kept our pickup and trailer in his front yard. While enjoying our stay with Rod and his family we operated daily, using his rig.

In the eastern states, campgrounds had less open ground. In Tennessee we found a nice location in a forest of tall trees near the Tennessee River. I had brought a slingshot with me for the age-old practice of shooting a fishing sinker and line over the branches. This method worked fine, and after a few practice shots I could put the fish line over just about any limb I chose. Somewhere in Texas I had purchased some inexpensive metal tent stakes to replace the screwdrivers I had been using. The tent stakes worked well and solved the problem of having my screwdrivers stuck in the ground when I needed them.

Setting up the antenna in the trees did present an unanticipated problem, as foliage will short out an antenna. Positioning the dipole sometimes meant that it wasn't formed in a perfect inverted "V." In some cases, the legs were as far off as 20 to 30 degrees in either the azimuthal or horizontal planes, or both. At times the tree height dictated that the antenna be up no higher than 20 feet. No matter what the odd configuration, there was no appreciable difference in reported signal strength.

While in Tennessee, we worked California regularly, plus the East Coast and Florida. Both 15 and 40 meters worked well, although after leaving the Pacific coast I was never able to work the Maritime Mobile Net.

Once, in a heavily forested campground in Virginia, the trees were so thick that it was impossible to keep the low-lying branches off the antenna. As an experiment, we tried operating. The SWR went off the scale on the high side and we had to shut down the rig.

At my son's home in Brunswick, Maine, his property is bounded on three sides by 60-foot-tall trees. Again, using the slingshot, we set up the antenna. This time it was spread out to its full length in a level plane, up nearly 40 feet.

I had planned to use the trailer as a ham shack while staying in their home. Instead, my

**Continued on page 15**

**Photo A. A 22-foot travel trailer, towed by a Ford 250 pickup truck, provided the author, WF6P, and his wife, AB6XJ, a mobile base for many hours of operating. During their 7,000-mile trip they maintained daily contact on both CW and voice with ham friends and relatives.**

**Photo B. AB6XJ keeps contact with their son, N6UZI, in Maine, and daughter, KN6RR, in California, from their campsite in Kansas. CW was used when conditions did not favor voice transmission. Late at night, earphones were used with CW to preclude disturbing other campers.**

# RF vintage review

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# The Icom IC-25A 2m FM Mobile Rig

**by Chris Brown KA1D**

It may be a mystery to most of us how the manufacturer managed to stuff so many components, operating features, and good ideas into so small a package, but it is no mystery that the trend in ham gear today is toward the small. In this ham's opinion, with reference to medium power (25-W) VHF ham gear, the apogee of miniature electronics is reached by the ICOM IC-25A 2 meter FM mobile rig.

## Features

The rig measures a mere 5" by 2" by 7" and weighs in at a paltry 3.3 pounds. Within these Lilliputian dimensions, ICOM has crammed 48 transistors, 5 FETs, 19 ICs, 91 diodes, and a 4-bit microprocessor to keep track of the lot. The result of this shoe-horning is a feature-packed mobile radio that offers the user: 25W/1W power outputs, scanning of five memory and two VFO frequencies, full or programmed band scan, programmable splits for non-standard repeaters, dual-speed VFO tuning in 5-kHz or 15-kHz steps, seven-segment S/RF LED bar display, priority channel function, normal/reverse function for monitoring repeater inputs or working inverse splits and, most important, two fully-independent VFOs. And all this from the front panel!

Should you require more options, you need only open the top cover to gain access to: a scan speed control, a scan-stop timing control, a scan-stop timer switch, and a scan-stop function switch. The last allows the operator to choose either busy or open channels for scan-stop.

By comparison, the rear panel is simple. Here, arrayed around a massive heat sink of the SC1019 power amplifier, is a power-connection cable, an SO-239 antenna connector, and an external speaker jack (4 to 8 ohms).

The IC-25A is designed to run off a 13.8 VDC source, and no provisions are made for reversing the negative ground configuration of the supply. The manufacturer claims that the unit draws 400 mA in squelched receive and 600 mA with full audio output of 2 watts. In the transmit mode, the rig draws 1.3A at 1 watt out and a healthy 4.8A for the full 25W output. ICOM suggests that a 6A supply be used in base-station applications.

## Design

Electrically, the IC-25A exemplifies solid design practice. The transmitter uses a double-balanced mixer and variance-reactance frequency modulation to generate 16F3 output. A high-impedance dynamic mike with built-in Touch-Tone pad and preamplifier is provided as standard equipment. The receiver employs a double-conversion superhet scheme (IFs at 16.9 MHz and 455 kHz) as well as a MOSFET RF amplifier. A double-balanced mixer, two monolithic crystal filters, and several ceramic filters are provided to improve selectivity.

The most unusual aspect of the IC-25A's design is the dual VFO system. The rig's heredity can be seen clearly from its frequency-control system, and anyone who has ever operated an ICOM 701, 720, 730, etc., will feel quite at home with the IC-25A. At the heart of the frequency-control system is a digital phase-locked loop (PLL) circuit that generates 40 MHz and 122 MHz signals.

A rotary encoder connected directly to the main tuning dial generates clock pulses for up/down frequency selection. A 4-bit-wide CPU chip running under the control of ICOM firmware provides the smarts. The result is an extremely flexible frequency-control system that allows for continuous tuning in 5-kHz or 15-kHz steps, depending on which of the two VFOs is chosen.

About the only feature left out of the IC-25A's frequency selection system is the ability to memorize offsets. As a result, operator intervention is required if operation is desired on a memory frequency with a new split.

## Performance

The bottom line for any piece of mobile gear is its performance on the open road. After commuting with the IC-25A for more than three months, I can say honestly that it is one of the friendliest mobile rigs I have ever used. Of paramount importance in a rig this size is front-panel layout. With 13 controls jammed into an 11-square-inch area, the ergonomics of the layout had better be good.

VFO and memory-selection channel switches are located toward the driver, on the left side of the front panel. The large main tuning knob also is skewed to the left. Volume/on-off and squelch/high-low power controls are placed adjacent to one another and, immediately above them, three push switches provide easy (yet isolated) access to scan-width control, simplex/duplex control, and Nor/Rev function.

The one inconvenient placement on the front panel is the proximity of the memory-write switch and the scan-stop switch. A problem often occurs when, in an effort to initiate scanning, an operator inadvertently depresses the memory-write switch. When this happens, an erroneous frequency (whatever happens to be in the VFO at the time) will be written into one of the memory channels. The problem is further compounded by the identical feel of the switches. (Mike-scan control is an option, however.)

Another front-panel shortcoming involves the display. Aside from the normal visibility problems inherent with red displays operating in bright sunlight, the IC-25A display is difficult to read because it uses an LED instead of a full seven-segment digit in the 5-kHz position. As a result, it can be difficult to discern whether the frequency is 7.37 or 7.375. There seems to be room on the front panel for a full-size four-digit display, and the rig certainly would benefit from the addition of a real digit in the 5-kHz position.

Used in conjunction with a 1/4-wave whip, the IC-25A was able to access any repeater it heard. In fact, it often heard too much. My unit displayed adjacent-channel interference on strong signals (40-60 dB) 15 kHz away from the center of the passband, resulting in cross modulation of the incoming audio. The problem seemed more acute on the high side of the passband, indicating a slight receiver alignment irregularity. In any case, the problem, though annoying, was apparent only on the strongest of signals.

With any radio of this complexity and compactness, documentation is crucial. ICOM has done a laudable job in this area, and its efforts are by no means limited to the 34-page owner's manual. An 11" by 16" schematic is included, as well as life-size component overlays for each PC board. When used in conjunction with the comprehensive theory-of-operation section of the manual, graphics like these could get hams once more into troubleshooting and even repairing their own gear.

The IC-25A is an impressive package of performance and features. Its small size will make it attractive to owners of today's gas-efficient micro-cars, and as an added benefit, when installed in-dash like a normal car radio, the rig is relatively immune to theft. If you want big radio functions in a small package, ICOM's IC-25A is worth your consideration. RF

*Reprinted from the July, 1982 issue of 73 Magazine.*

# advertiser index

# Reducing the Barrier

## *Effective Morse code training.*

**by David G. Finley N1IRZ**

Even though proficiency in Morse code is required for HF privileges, typical training methods are inefficient. In fact, in many cases, they are tailor-made for creating frustration, disappointment and ultimately, abandonment of the effort. This has been demonstrated by psychological research and the experience of thousands of would-be hams over the past few decades.

With the advent of the no-code Technician license in 1991, many of those once-would-be hams are now on the air. As they contemplate upgrading their licenses, they once again face the obstacle of Morse code. They, along with ham radio newcomers, deserve the benefit of better training methods. *Vastly improved methods are now easily implemented by nearly anyone.* Amazingly, the most efficient training technique—one dramatically faster than the traditional amateur method—was devised more than 50 years ago, yet is virtually unknown to most members of the amateur radio community.

Why haven't more effective means of Morse training been used by the amateur community? There are two reasons—one technical, the other sociological. The technical reason is that the most effective technique was very difficult for individuals to use before the availability of personal computers. The sociological reason is that the amateur community, at least until recent years, has not wanted Morse training to be quick or easy. The Morse code requirement has long been considered a "filter" for keeping the unmotivated or the unworthy off the ham bands. Spending long hours learning code was considered a rite of passage that "entitled" one to be a ham operator.

Now, with the tremendous demand for RF spectrum, the best insurance for retaining our amateur frequencies is to increase the number of active hams. Four out of 10 U.S. hams are Technicians. It is not in the best interest of amateur radio to have them consider the 13 wpm code requirement an insurmountable barrier to full enjoyment of the hobby.

Argument continues about whether the requirement should be lifted, but any such move would be years away. By making Morse training as effective and efficient as possible, the requirement can be made far less a barrier—and the benefit comes right now.

### The Frustrations

What frustrates people in their efforts to gain code proficiency? What goes wrong en route to 13 words per minute? People who have mastered the material for an amateur written exam routinely are stopped by the code requirement. People with deep knowledge of electronics, accomplished engineers and technicians, have been stymied by the code. Many people with advanced degrees are among those who abandoned the attempt to build their code speed to 13 wpm. These people are *not* lazy or dumb.

The fact that so many otherwise qualified and motivated people have abandoned ham radio at the 13 wpm barrier indicates that there is something seriously wrong—not with them, but with what they've been told about gaining code proficiency. The problem lies in two principal areas—traditional attitudes about code training, and traditional techniques of code training. The combination of the wrong attitude and highly inefficient techniques leads to speed plateaus, frustration, and quitting. Indeed, what is amazing is not that so many people abandoned the effort but that so many managed to overcome these formidable obstacles.

Approaching code training with the proper attitude and with techniques that are based on sound psychological principles dramatically increases both the chance of success and the speed with which it is achieved.

### The Attitude

Two words, and our past experience with them, are primarily responsible for imparting the wrong attitude about Morse training. Those words are "learn" and "study."

In school, on the job, or on our own, we've been learning new things all our lives. In learning things such as AC circuit theory, radio wave propagation, or calculus, we gained our knowledge through study. That study involved many processes, including hearing an instructor's explanation, reading, poring over diagrams, and working problems. Success came when, using some combination of those processes, we had thought about the subject matter in enough different ways that we grasped the concept and understood it. Learning this way is a conscious, deliberate enterprise.

The trouble comes when we try to apply this experience to the task of gaining code proficiency. In the traditional amateur approach to code training, we learn about dits and dahs, character and word spacing and other details, then memorize the characters, a few at a time. Once that is complete, all our past experience tells us that we've finished the job. If anyone asks, we can tell them what any character should sound like. We "know" the Morse code. The problem, of course, is that we can't copy at any reasonable speed.

This is where frustration sets in. Following the traditional approach, one can copy only very slowly—typically at 2 or 3 wpm-after memorizing the characters. After that, greater copying speed comes slowly and painfully, and, at times, no increase at all may be evident for days or weeks. At this point, people accustomed to learning things quickly begin to tire of the apparently fruitless effort. Sometimes the slowness or lack of progress makes them wonder if there is something wrong with them. This saps their confidence. Frustrated, tired, and losing confidence, they quit. Another potential ham dropout is created.

The right attitude begins by breaking with our previous ideas about learning and studying. Morse code training is a completely different affair. Learning Morse is *not* an intellectual pursuit. Let's emphasize that point: There is absolutely no—read zero—intellectual component to learning Morse code. You are not learning AC theory or calculus; you are building *reflexes*.

When talking about Morse training, we probably should replace "learning" with "conditioning." Furthermore, you don't "study" Morse code—you *practice* copying it.

The realization that you are conditioning yourself to copy code, coupled with efficient training techniques, blows away the misconceptions and self-doubts that have frustrated people for years. The fact that Morse training is a conditioning process, not an intellectual process, also means that, if you can tell a dit from a dah, you almost certainly can gain code proficiency with enough practice.

### Technique: The Objective

The objective of Morse training is, of course, to develop the ability to copy code. Let's examine two means of decoding Morse—the wrong way and the right way. These are illustrated in Figure 1.

The wrong way, shown at the diagram's left, is a lengthy and conscious, process. In this process you hear a Morse character, mentally translate it to didah form, then compare the didah pattern to the "lookup table" formed in your brain when you memorized the characters. Once your brain finds a match to something in the lookup table, you can finally write the character you heard.

The problem with this process is that it involves too many steps and too much mental processing. It is the result of having an intellectual, rather than a reflexive, knowledge of the code. It works all right at 5 wpm, but shuts down from overload at about 10 wpm. The training "plateau" most people experience at around 10 wpm is caused by the breakdown of this process. While stuck at the plateau, people begin, usually without realizing it, to form the reflexes for real code copying. After that is complete, they can resume progress.

This cumbersome, multi-step decoding process is an inevitable result of the traditional approach to code training. It comes from approaching code training the same way we approach learning multiplication tables. The difference is that with multiplication tables there is no speed requirement, and if we forget a memorized answer we can figure it out based on knowledge. With Morse, speed is essential and there is no way to "figure out" a forgotten character.

Any Morse training method that allows the formation of a lookup table in the brain is deadly to high-speed copying. This applies not only to the traditional method, but also to any methods that use mnemonics, musical cues or other memory aids.

The right way to decode Morse, shown at the diagram's right, is simple and fast. It comes from having code copying burned into the brain as a reflex. In this process, a character heard is reflexively written, with no conscious thought. This ability comes through conditioning, not through study. This is the only way to copy code much above 10 wpm.

Developing code copying as a reflex, then, must be the objective of our training program.

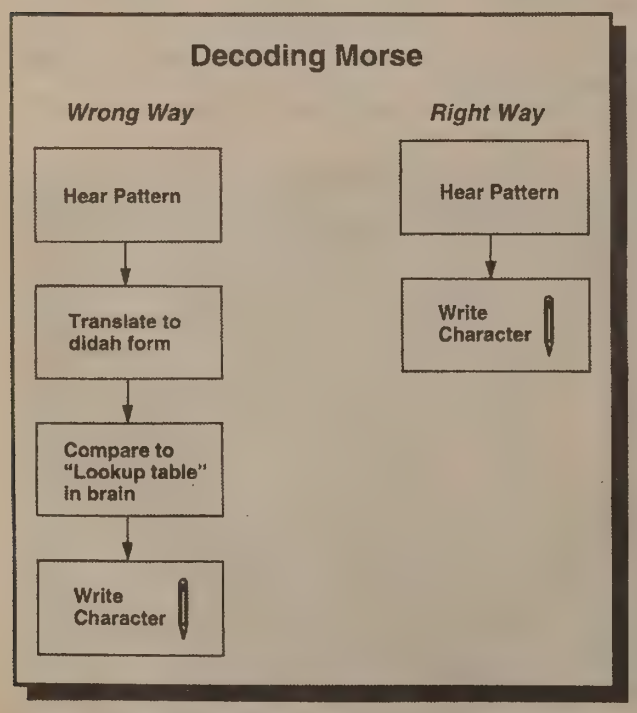


**Figure 1. The traditional, and wrong, way of learning Morse forms a lengthy and conscious method of decoding characters. The right way to decode Morse is short and reflexive.**

### Technique: Things to Avoid

There are a number of traps—"aids" and techniques often used and often time-honored—that must be avoided for efficient training. These include:

•Visual charts—you want to copy Morse by ear, not by eye. Visual dot-dash charts only slow the process by adding yet another step to the long process in Figure 1. That added step is translation of the aural didah pattern into the visual dot-dash pattern for comparison to the lookup table. Such charts, then, can only further slow your progress.

•Slow code—Morse at 5 wpm and Morse at 13 wpm are two different things. To go from 5 to 13 wpm necessarily entails starting over at the 10 wpm barrier. All time spent copying at 5 wpm is thus wasted.

•Code tapes—most people don't realize how quickly, and subconsciously, they can memorize a code tape. The nasty surprise comes when, thinking they can copy at 13 or 15 wpm, they hear something not on their tapes and can't copy at all. Effective training requires a source of truly random sending for practice.

•Copying QSOs off the air—you have no way of knowing the exact speed of any QSO you hear on the air. Knowing, and pushing, the speed of your practice is essential to developing code proficiency. Also, there is a lot of terribly-sent code on the ham bands. Your amateur examination will consist of perfectly-sent code. You want to copy—and later send yourself—perfectly-sent code. The only exception to this rule against copying off the air is W1AW (ARRL) code practice sessions, which are, in fact, perfectly-sent code.

### Technique: Training by the Koch Method

Psychologists did considerable research on Morse training in the 1930s and 1940s, probably spurred by military needs for large numbers of code-trained operators. In fact, many of the studies used military trainees as test subjects.

The fastest training method on record was devised by the German, Koch, in 1936. While amateurs today consider 60 to 80 hours of training to be the average time required to reach 13 wpm, Koch trained a group of students to copy at 12 wpm in 13.5 hours. An American researcher repeated the experiment in 1942, nearly matching the feat. Koch's method achieves this quick result because it arises from a recognition that Morse training is a conditioning process and focuses directly on building copying proficiency as a reflex.

Koch's technique is elegant in its approach

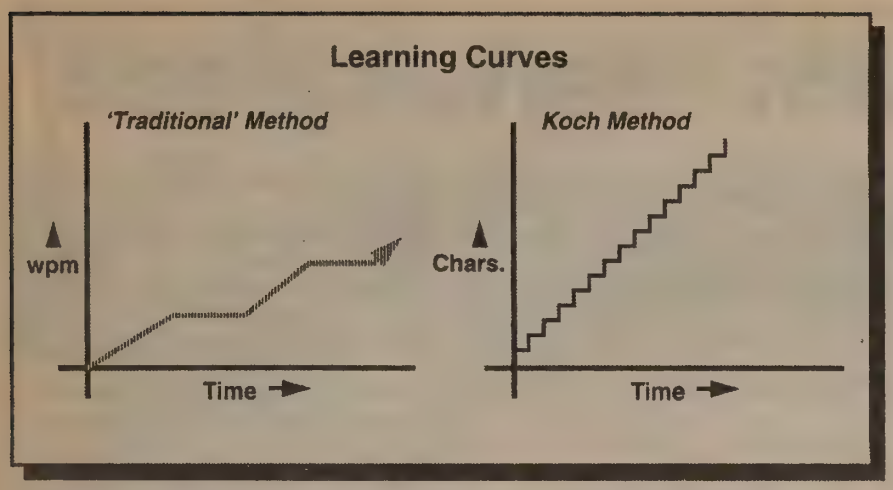


**Figure 2. The traditional method of learning Morse forces the student to climb a slow learning curve with occasional plateaus of periods with no apparent progress. The Koch Method, on the other hand, provides frequent positive reinforcement as new characters are regularly added to the practice sessions.**

and its simplicity. The student never hears code at less than the target speed. Training begins with only two characters sent randomly at the target speed. When the student can copy those two characters with 90 percent accuracy, a third character is added. When the student's accuracy again reaches 90 percent, a fourth character is added, and so on. Once all the characters are learned, the student is already copying at the target speed; the goal has been achieved.

This method builds the necessary reflexes directly and quickly, and avoids all the pitfalls associated with the traditional amateur method. It probably was overlooked for years because, before personal computers were common, it was difficult for individuals to implement.

Koch's method has two major advantages. First, of course, is its speed. It builds code proficiency faster than any other method in the psychological literature. One warning is in order, though. Koch, like most researchers of his era, screened his students, retaining only those who initially showed what he considered an acceptable level of aptitude. That means that you may not learn as quickly as his students—but you still will learn more efficiently with Koch's method than with other techniques. The second major advantage is that Koch's method will succeed where others fail, because it provides less frustration and more positive feedback. From the time you first hit 90 percent accuracy with two characters, you realize you *can* copy at 15 or 20 wpm because you just did it. After that, each new character added is further confirmation of your progress. There are no long plateau periods devoid of progress to sap your confidence. (See Figure 2.)

It is, of course, not magic. Keep in mind that you will have good and bad days, and some characters may be more troublesome than others. Still, you should see steady progress as you add characters at regular intervals. Remember that as you are learning each new character you are learning it at full speed—you will never have to re-learn it to achieve your goal.

How should you go about learning by the Koch method? First, use a computer. A number of software packages for personal computers allow you to learn by the Koch method. What you need is software that will send randomly from a set of characters you can select. You will first select two characters and practice with them. This means, naturally, that you'll be receiving random groups of characters rather than words. If your software allows, you should have these random groups sent as variable-length groups rather than fixed-length groups. This will ease the transition to words.

If you're aiming for the 13 wpm amateur test, you should begin practicing at 15 wpm to provide the "buffer" you may need to counteract nervousness at exam time. The characters themselves should be sent at no less than 18 wpm, and preferably at 20 wpm. This is the famous "Farnsworth method" of sending the characters at a faster speed and adding spacing between them to bring the overall sending speed down to the desired level.

Not only Koch but other researchers as well emphasize the need for regular practice sessions of short duration. One or two half-hour sessions per day will work well for self-training. In the Koch method you must copy on paper—that is the reflex you are building. Use a pencil—that's what you'll use at the exam.

The key to success with the Koch method lies in constant testing. With each practice session, you must copy for a sustained period, at least five minutes, then grade your performance. If you've reached 90 percent accuracy, add another character. If you've reached 89.9 percent, practice some more. After adding each new character, you'll see your accuracy fall, then recover. This is a natural training cycle.

How long will it take you? Time your practice sessions and keep records. Some software packages will do this for you. After you've learned a few characters, simply divide the number of practice hours by the number of characters. This tells how long it's taking you to learn a character. Multiply this by the 43 characters required for the amateur test, and you have a pretty good indication of how long it will take to learn them all.

Once you've learned all 43 characters, it's time to make the transition from copying random characters to copying words. This will require some time, because random groups and words have a different character mix and "rhythm." If you've been copying variable-length random groups the transition should be easier than if you've been copying fixed-length (e.g., five-character) groups.

The amateur Morse exam consists of a sample QSO. This should direct some of your final practices. If your software allows, you should include some practice in copying callsigns—at least one exam question will involve a callsign. You also may want to practice copying some common "ham" words. Finally, many software packages will send a sample QSO very similar to those in the amateur exam. Take advantage of this very specific type of practice—it will pay off. When you're copying the sample QSOs at your target speed, you're ready for the exam.

### Summary

Acquiring code proficiency need not be painful. It does require time, but keep in mind that the time is spent building reflexes, not because you're a slow learner. Remember that building code proficiency has nothing to do with intelligence or learning. Recognize that you are not studying, but practicing in order to condition yourself and build reflexes. Then, use the Koch method—which is the fastest known way to build those reflexes—and you will have the powerful tools of the right attitude and the best technique on your side. RF

### Bibliography:

Peak, H., "Koch's Method of Learning Code Reception," *Psychological Bulletin,* XXXIX (1942), p. 495.

Taylor, D. W., "Learning Telegraphic Code," *Psychological Bulletin,* XL (1943), pp. 461-87.

Taylor, D. W., "The Learning of Radiotelegraphic Code," *American Journal of Psychology,* LVI (1943), pp. 319-53.

O'Keeffee, V., "Learning Morse," *QST,* August 1972, pp. 58-62.

### In What Order Should I Learn the Characters?

First, remember that for amateur tests you are responsible for knowing 43 characters—all the letters of the alphabet, the numerals 0 through 9, period, comma, question mark, slash, and the prosigns BT, AR, and SK.

You *don't* want to start with E and T—the two shortest characters will come at you so quickly you'll wonder if you ever will copy them!

Over the years, researchers have made lists ranking the Morse characters in order of their difficulty, based on errors in copy. Other researchers, however, have showed that the characters missed most in copy are those least used, and that the "difficult" ones are copied quite accurately when they receive as much attention in training as the others.

The Koch method seems to largely overcome this problem in that you spend the amount of time necessary to assimilate each character before adding another to your training sessions. Still, it appears useful to mix long, "hard" characters and short, frequently-used ones rather equally as you progress.

Based on this idea, here is a suggested sequence:

K M N R S U A P T L O W I . N J E F 0 Y , V G 5 / Q 9 Z H 3 8 B ? 4 2 7 C 1 D 6 X BT SK AR

## Cross-Country Operating

**Continued from page 12**

daughter-in-law's sewing room was generously converted for that purpose. Most of our contacts in a 30-day period were with South America or Canada, and with many states on the eastern seaboard. I was in contact each night with KA5NIM in Arkansas. We had kept to our long-standing schedule at 0600 UTC. The problem was, 0600 UTC was 2200 PST, 2300 Mountain time and 0000 Central time. That meant that what had been a convenient time for me in California became increasingly later as we traveled east through the various time zones. Worse, in Maine it was 0100 Eastern time! KA5NIM is an artist and writer who works at night so his routine was vastly different than my daytime activities.

It was impossible to work San Diego on the Novice bands on either 15 or 40 meters. Although my daughter and I made contacts on schedule, our QSOs were nothing more than an exchange of faintly-heard callsigns. However, KA5NIM relayed messages or worked KN6RR when I could not.

On the return trip to California, we stayed for three nights in the Rocky Mountains of Colorado, near Poncho Springs. There we rigged the antenna in a thick grove of short pine trees. The antenna was the lowest height ever, no more than 15 feet above ground. One guy line was tied to a tree and the other to the bumper of the camper. Our campsite didn't seem favorable for operating, as we were parked on the side of a steep, rocky slope, at about the 9,000-foot floor level. A light but persistent rain fell, blanketing the trees in a shroud of drippy wetness. With the antenna so poorly situated, I had little hope of us getting out at all.

When we began operating, we were amazed at the strong signal reports we received from all contacts. That night my Arkansas and California contacts came in clearly and we worked our normal hours-long QSOs.

While operating at this site, our young teenaged trail guide saw our antenna and was curious about our radio setup. He expressed a strong interest in becoming a ham, and next summer when we return, we will try to help him get his Novice license.

### My Suggestions

Setting up or taking down the antenna was a job that took only about 10 minutes, depending upon the terrain and other variables. Once down, the antenna was coiled and tied together with cord or plastic bag twist seals. The few minutes of extra care taken when dismantling the antenna helped ensure easy erection for the next camp. The entire antenna, ground wire and other materials (less poles) were kept in one cardboard box.

About 70% of the campgrounds we used were suitable for dipole antenna use. While permission was never requested directly of park proprietors, no problems of any sort were voiced either from them or other campers.

We carried a spare battery for the trailer, as some state parks do not have electrical power. Many of these parks allow free parking and are ideal sites for operating. The Petroglyph State Park near Austin, Nevada, was one I had in mind and planned to revisit. Unfortunately, we took a different route than originally planned and missed that location. All of the private parks we stayed at provided commercial power.

When traveling across some of the desert areas in Nevada, long stretches of road for a hundred or more miles had no water nor automotive service facilities. It was comforting to have the HF rig along for emergency purposes in case of breakdown.

Our three-month on-the-road vacation was one of fun and excitement. Using our ham radio was one of the highlights of our trip and allowed us to keep in touch with our friends and relatives. While we used our 2 meter rig constantly during the day, the low-band rig was a welcome diversion at night. Our trip progress reports were passed constantly to our daughters, either directly or by messages through local ham friends.

Would I do it again? Yes. I have the antenna box and poles stored in their own place in my garage. Not only is the antenna ready for our next trailer trip, it is always ready for Field Day or any natural or man-made emergency. RF

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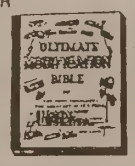


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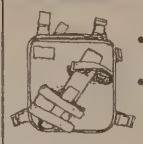

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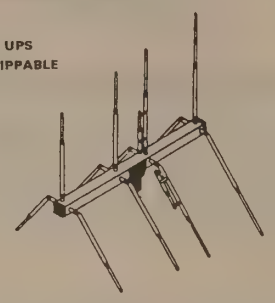

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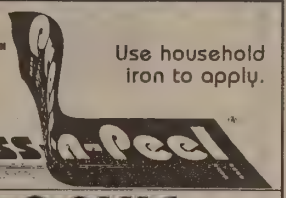


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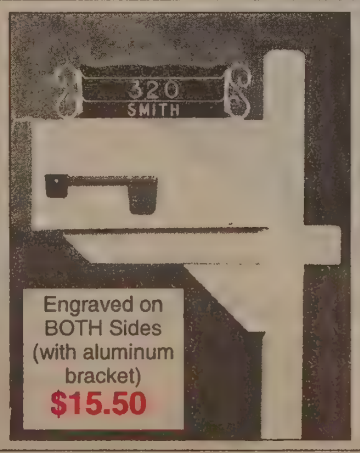


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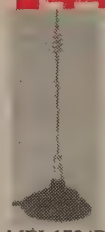

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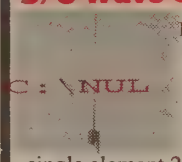

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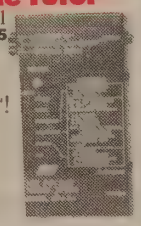

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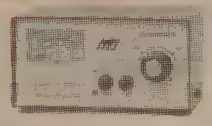

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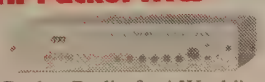

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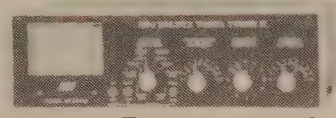

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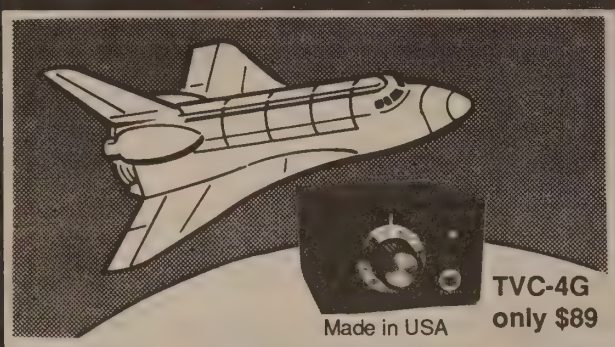

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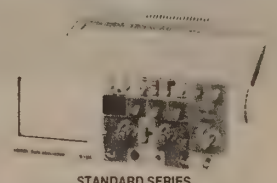

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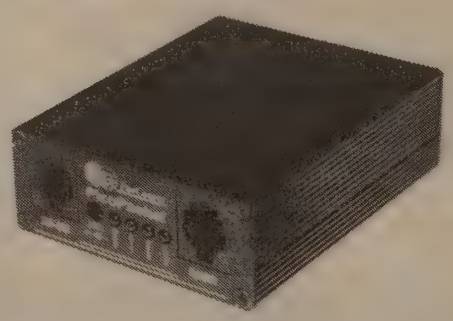

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# Mini Log-Periodic for 10 and 15 Meters

**by Richard A. Clymer W1FPF**

During the past 40-plus years, since I began hamming, I have had only two commercial antennas, both of which were verticals. One, back in the '50s, met its demise by a direct lightning strike. The other I've just acquired from a ham who decided to move back north. Anyway, it seems to me there is one thing any ham ought to be able to do: build his own antenna. In this period of time I have just about run the gamut as far as home-brew antennas go: verticals, longwires, quads, dipoles, J-poles, off-center-fed windoms (a good all-band antenna), and beams (including the "Economical Beam" I described some years ago in *Ham Radio* magazine, March 1970).

Recently, the XYL spotted an accumulation of aluminum tubing in the corner of the garage and questioned what I intended to do with that "junk." "If it's no good, get rid of it!" There is nothing like a wifely ultimatum to stimulate the thinking process, to prove this was not a pile of junk. It was tubing I'd salvaged from an old TV antenna, saved with the idea of making a lightweight 10 meter beam. Because 10 meter openings had been about as scarce as snow in Florida, I had put the project on hold. Now I had to fish or cut bait.

As I reviewed this project, another idea materialized. I have a penchant for experimenting. Why not try to build a half-size log-periodic covering 15 as well as 10 meters? The result is a functional beam that is no more obnoxious than a TV antenna, a particularly desirable feature in Florida, where ham types like us are not welcomed with open arms by a majority of condo and neighborhood associations. (Yet I suspect that members of some of these groups are first in line during a hurricane or similar emergency to ask that we get a message through immediately to Aunt Minnie in West Cornfield.)

I dug into an old file containing all sorts of miscellaneous hamming data and found some very interesting information pertaining to the log-periodic, sort of "rule of thumb" stuff. It was not startling to find that the longest element should be approximately one-half wavelength in length at the lowest operating frequency. For 15 meters this computes to about 22 feet. The data also indicated that each succeeding element should be about 85% of the length of the preceding element. The spacing between each element should be approximately 17% of the previous element's length.

Unfortunately, my notes did not include the source of this information. But, this was an experiment, so "what the heck, let's see what happens," I decided. Therefore, I used this data and computed the lengths of the elements to be as follows: 1st element—22 feet; 2nd—18.08 feet; 3rd—14.86 feet; and 4th—12.21 feet. The spacing was calculated to be 3.74 feet, 3.07 feet, and 2.52 feet, respectively.

## Construction

Obviously, it's impractical to build elements of this length from this type of small-diameter thin-wall tubing. Therefore, I decided to cut these lengths in half. I then cut two pieces of tubing 5'5" long, which, when mounted on the element base with a 2" spacing, produced an element a total of 11 feet long. I repeated this with each element. The second required two pieces 4'6" long, the third two pieces 3'9" long, and the fourth two pieces 3' and 5/8" long.

These were assembled to wood bases 8" x 1-1/2" x 3/4", which were painted with an alkyd base paint. See Figure 1A. The assembled elements were now attached to a boom and spaced as indicated in the above calculations. See Figure 1B. I then ran #14 solid transmission wires between the element assemblies along the length of the boom, making certain to transpose the wires at each succeeding element terminal. It goes without saying these elements are short electrically for the frequencies we want to use. Therefore, to provide a complete electrical one-half wavelength, I added a one-quarter wavelength stub of 300-ohm twin lead to each element. One end was attached to the element feed terminals and the free end was taped to the mast.

Because I wanted to feed the antenna with 52-ohm coax, I wound up a 4:1 coax balun and attached this at the feed point at the front of the beam. Now I was ready for testing.

## Testing

I mounted this beam on a 15-foot mast and propped it up against the house to check the SWR. Although the coverage wasn't broad, I found that the antenna covered an acceptable frequency range on both bands.

I heard some activity on 10 meters, so I loaded up the rig to see if this thing would work. I made contacts with three LU stations, an HK3, YU5, VP2, and ZF2, and several stations within the states. With 10 being in less-than-satisfying condition, I was quite content with the results.

Fifteen meters was even better. I made contacts with YU5, VE3, DF1, G2, PV7, HC8, as well as several within the states. All of these contacts were made with the rig loafing at less than 50 watts.

Lacking the proper equipment, I have not been able to check the front-to-back ratio and gain at this time. I'm certain most commercial and home-brew beams will outperform it. I know it's not pretty, but it's a fun project for anyone who likes to tinker and experiment. And, perhaps best of all, it's cheap. My total cash outlay was less than five dollars, as almost everything came from the scrap box except for some new hardware. Have fun! RF

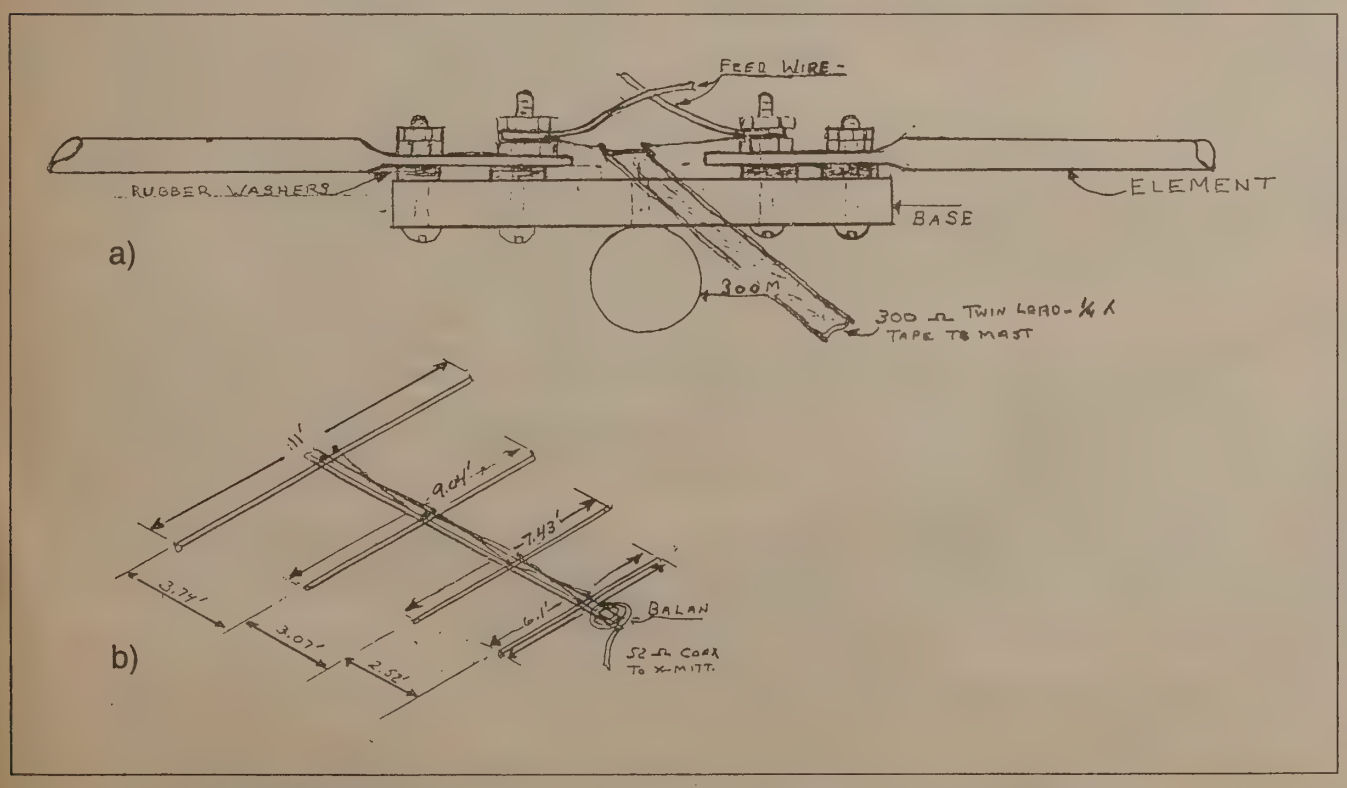


**Figure 1. Detail of the element assembly: A) attaching the elements to the wood base; B) attaching the elements to the boom.**


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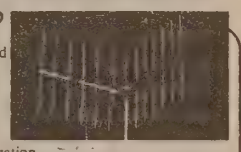

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# Amateur Radio—Fascination and Encumbrances

## *One ham's ruminations on the hobby.*

**by Thomas G. Rampton NØUFQ**

The central mystery of radio is that a signal from one antenna can have an intelligible effect upon another—across the street or far away. Other things about it are mysterious, too, but secondary.

I've been down several paths in life. One led to amateur radio a couple years ago. There's much good in ham radio. Good people, too. But a few things are wrong—primarily the code requirement and the licensing structure.

I've been an electronic kit builder for years, and a signal generator I built while in high school helped perpetrate an evil deed. Perhaps, thought we, this amazing transfer of RF energy had application to a guy across the alley who blasted his stereo at an obnoxious volume, tuned to a broadcast station.

We fixed him. In the garage, a friend and I connected my signal generator to a wire strung around the rafters. We knew little about antennas, but sufficient RF got out to turn the guy's racket into a chilling screech. A satisfying result, straight from radio's mysterious core.

Filled with wrath, he emerged the next day and dumped all his tubes in the trash. A stereo with tubes? This was years ago. My signal generator had tubes, too. He repeated the procedure with his antenna, but eventually got the point.

Thinking back, it was mostly my friend who did this heinous, illegal thing. His garage, his wire, his neighbor. Yeah! It was him, not me. Only the signal generator was mine. If guys with badges ever show up wanting to know about this, it was over 30 years ago so I probably wouldn't remember much.

### On Morse Code

I used to have two gigantic Hallicrafters receivers. One was a general coverage receiver with which I often monitored the amateur bands. A ham friend made several contacts as I watched.

Why didn't I get into amateur radio then? It was the Morse code requirement. I'm not a code person. It would be 30 more years before I got into amateur radio, when the Morse code requirement was dropped on the higher frequencies.

If others want to use code, that's fine. They claim certain advantages, so go for it. Just leave me out. I dislike it, have no interest in it, and find it irrelevant to my interests in amateur radio. Others may feel differently, but this is a broad hobby. I tend to disbelieve stories about how someone scratched out a crude, non-radio code message from inside a sinking ship and saved everyone. Even if there are true stories of this sort, I doubt the code speed was very high. The 13 and 20 wpm code tests are irrelevant from this angle too.

The appearance of books with titles like *Morse, The Essential Language* is a sure sign that code is dead. Other writings have explained how much the author loves code, followed by the hope that code will continue to be laid on the rest of us as a licensing requirement! If code were so great, hams would flock to it. But they don't.

On the Colorado Connection (a system of linked repeaters) net, amateurs were asked to check in one evening by license class. The great majority were codeless Technicians, which confirms the obvious: No-code is the preferred route into amateur radio.

Lots of interesting people will choose another hobby upon finding they must waste many hours for any but the most basic license. This is amateur radio's loss.

Many Advanced Class licensees could run circles around the Extra written exam, but why? "It's not worth it" to learn code at 20 wpm, one said. Upgrading really amounts to a code test, and this is wrong. Code proponents admit this is to keep out those who by their wrong-headed reckoning, "won't put forth the effort."

What it does is keep out the people who (1) can't do code or (2) don't have time to waste, however much they learn about radio. Code proponents long for the "good old days," but they're gone. Amateur radio will no longer be associated with code by the public, just as news broadcasts don't start with sounds of clattery teletype machines anymore.

Some struggled to learn code and wish that on the rest of us. "It's been a part of the hobby for a long time," one ham said. Sorry, but that's not a good reason. I never struggled to shift Model-T Fords. Would this guy like to take away my commercial driver's license? I've never flown a biplane. Should the FAA revoke my commercial pilot certificate? Amateur radio is changing. Code proponents can change too, or be left behind.

> ***"Lots of interesting people will choose another hobby upon finding they must waste many hours for any but the most basic license. This is amateur radio's loss."***

One letter-writer boasted of having never owned a microphone. That's OK with me. I know of people who do laundry with a washboard. Just don't lay it on me. Some new amateurs get brainwashed into thinking code is "the link between hams." But a friend commented that code is really a link between hams and dinosaurs.

Monitoring a large-city 2 meter repeater while there one day, I learned that someone had maliciously introduced computer viruses into a ham-oriented computer bulletin board system. Later that day, others were talking about the situation. One guy actually blamed the no-code license for this vandalism! Continuing that tangent, another said the code speed requirement should be raised because you only become code-fluent at higher speeds. He never explained what purpose this would serve. Stop vandalism? Yeah, right!

Later, a comment was made on the same repeater that code should be required because a few might come to like it. So help me, somebody said that. Why not sit us all down and make us eat liver? Some would like it.

Yes, I know there are various code-teaching techniques but that's not the point. I don't want to waste time and money on something irrelevant. Let's get rid of the code requirement.

Let's also reorganize some band plans. Half of most HF amateur bands are devoted to CW, which is past tense. Complaints about crowded bands refer to the voice subbands.

### License Structure

The licensing structure is another problem, with six license classes. Just to use a radio! To pilot an airplane without being paid, there are only three license classes: student, recreational, and private pilot. Two more allow flying for hire. Piloting carries more responsibility than using a radio. To repair this ridiculous situation, I propose the following:

- The lowest amateur radio license would be like today's no-code Technician. Novice would be dropped.
- The next would be similar to today's General, either with a minimal code requirement (5 wpm to satisfy international agreements) or none at all. Any code testing would involve only callsigns, not a fake QSO about weather, rig, and antenna. Prodigious radio knowledge would be required.
- The highest class would be similar to today's Advanced and Extra licenses combined, with an important difference: A specialty examination would be required, be it amateur television, data transmission, satellite communication, DX procedures, or other topics. Yes, code would be a specialty, but speed wouldn't matter much. Few would take that route.

Should present Advanced and Extra licensees be grandfathered in? Oh, I suppose so. Most are inquisitive, accomplished people. But some tried to keep me out of amateur radio and would take my license away now if they could. If given a specialty examination to find out what they've been learning lately, most would do fine but a few would crash and burn.

For those who persist in propping up code when amateur radio is moving toward data communication, how about a 40-wpm typing test?

Sentiment exists for making written exams harder. Here's how: Instead of test questions with only one correct answer and three wrong distractors, write questions where one, two, three, or all four answers might be correct. The examinee would mark all the correct ones but none of the wrong ones. This is much harder than four choices of the sort that say, "A and C are correct." I did this while teaching high school chemistry and it was my best-ever invention.

Guessing would be fruitless. Memorizing answers would be very difficult, particularly if answers could be presented in any order. Questions would be written so those who do know the material would pass. Others would flunk. Answer-memorizers would have to learn the material instead. Questions that measure understanding would be emphasized. I volunteer to help write tests.

Letters will arrive calling me a "crybaby," saying I "want something for nothing," or that I'm some sort of shiftless slug. Let their authors either shut up or come to my house and say that stuff. I'm in favor of hard tests and high requirements, but I want them relevant to amateur radio. A license should mean you know something about radio, not just that you're a code person.

### On-The-Air Behavior

Code proponents fear that amateur radio will get to be like CB, but this is groundless. I spent a few months driving a truck, so I've heard some CB and yes, it's a mess—often used for jabber between illiterates, and for law-breaking. Stolen goods get fenced. Lot lizards (truck-stop prostitutes) solicit. The ultimate in electronic detection devices, coupled with intense punishment, might help clean up CB.

Frequencies should exist that people can use without an exam. CB serves that purpose. I made several deliveries to places where CB was used to communicate with the horde of waiting trucks: "Load 1234, back up to door 17." I participated once in a multi-vehicle, week-long geology field trip that communicated by CB. I realize CB occupies a former amateur band, so resentment exists.

Difficult (and relevant) examinations will keep the riffraff out of amateur radio, provided the FCC treats license-violators in a Draconian manner. The crowd that exchanges inanities and illegalities tends to have trouble, shall we say, with the written word. That difference allows us to separate them out. They will not take tests, study for tests, or learn anything from a book. Amateur radio need not worry about CBers. Except for a few good ones, they aren't coming.

After I became a Tech-Plus, I bought a used HF rig and erected an antenna. The first HF conversation I monitored was considerably worse than anything I'd heard on CB. Three individuals in the eastern part of the country ridiculed the First Lady, then women in general, new or recently upgraded amateurs, and anyone who called CQ.

Their utterances were crude, indicative of limited vocabularies. They didn't give callsigns, of course. Were these guys the "real hams" we keep hearing about? If they were operating legally in the first place, they must have passed code tests. Didn't do much good, did it?

The 386SX computer on my desk would have occupied a gymnasium a few decades ago but is rapidly becoming a dinosaur. There is progress. Equipment shrinks but does more. Packet radio is booming. Yet I monitored a couple hams complaining at length about "technology taking over the world." Were they communicating with smoke signals or

# Do You Know the Time?

**by Robert C. Green W3RZD**

When you receive a QSL from a station in another country, have you ever noticed that the time, or even the date, may be different from what you entered in your log book? And have you ever wondered why? Let's take some time to study "time."

"Time is of the essence" is an old saying, and it is more true today than when it was first uttered. Essence is defined as being something of an invariable nature. Time does not vary, it continues without interruption in only one direction, always forward. Time played a part in everything that has happened in the past, and will continue to be a factor in everything that happens from this moment on.

Time can't be defined. It can only be thought of as a *when* or a *how long.* The two are different, yet related. You can say that your vacation will start on Monday, and then add that it lasts two weeks. The first part, *when,* refers to *epoch* or a place *in* time, and *how long* refers to an *interval* or period *of* time.

### Early Time Measurements

Since the beginning of the world, animals have had a sense of time, knowing when to migrate or find warmer quarters for winter. Man—and man is an animal—has done the same. Early man kept a mental calendar as to the seasons, to know when to plant crops or to hunt certain animals. When man learned to write, the calendar took on a different form, being inscribed in clay or stone. However, calendars varied in different areas of the world; each civilization had its own version.

Man has always had a form of religion, worshiping ancestors and things in nature, such as the sun, the moon and the stars. Priests and holy men began to revise calendars in order to keep track of moon, or lunar, cycles. In practically all societies the moon was thought of as a deity that played an important role in the lives of everyone.

As early as 3500 B.C., the Babylonians had devised a crude form of a sundial, and by 2000 B.C. they had invented a calendar based on a 29-1/2-day month, which gave a 364-day, 12-month year. The Egyptians devised a calendar with a 365-day year and a leap year. The most accurate calendar, one that can be compared to ours, was developed by the Mayas of Central America.

The need to divide the day into hours led to the invention of the clock. Probably one of the first attempts to create a timepiece was the water clock. This type of clock consisted of water dripping from a jar into a marked container. Sometime around the year 730 B.C., the Chinese invented a form of a mechanical clock. It wasn't until the middle 1400s A.D. that crude mechanical clocks appeared in Europe. However, the clocks were so inaccurate they had to be reset daily, using a sundial as a standard.

As the years advanced, so did the accuracy of clocks. The pendulum came into use as a clock regulator, as did the spring and escapement wheel. Today we regulate clocks by using 60-cycle house current or quartz crystals. The National Bureau of Standards developed a clock regulated by cesium atoms that loses only a second in 3,000 years. However, that atomic clock is already outdated by a newer one using hydrogen atoms. The hydrogen atom clock is accurate to one millionth of a second in 75 years.

When man first started to travel on the water, he always kept land in sight. He could travel during daylight, but at night he anchored or tied up to a convenient tree on the shore. Later, after realizing that the stars didn't change position and could be used as a guide, he began to venture farther at night, but he still didn't know when to change direction or head in to shore. Man also learned that during the day he could use the position of the sun as a guide.

### Latitude and Longitude

The introduction of the compass allowed man to travel farther, and, hopefully, in the right direction, but he still didn't know how far to go before changing course. By the 1700s, a navigator could find a position north or south of the equator by using the lines of latitude. Latitude is marked by imaginary lines parallel to the equator, with the distance between lines divided into degrees. A position was found by sighting an angle with the sun or a star, but to find a position east or west of a point was another story. The navigator had to know his longitude, and most importantly, how long in time he had traveled. Longitude is marked by imaginary vertical lines that extend from the North Pole to the South Pole.

***"Twenty-four-hour time was established to prevent mistakes between a.m. and p.m., in any time zone, and to be used as a worldwide standard time."***

Longitude around the world is divided into 24 segments of 15 degrees each, for a total of 360 degrees. The length of one degree measured at the equator is equal to 69.17 miles. The distance between the lines of longitude tapers from their widest at the equator to zero at the North Pole and South Pole.

To find how far a ship had traveled east or west two things were needed: a fixed point from which the distance could be measured, and an accurate clock to show the length of time the ship had traveled. The fixed point would be zero longitude, or the Prime Meridian, and this would also be the point from which the time was measured.

### Time and Date Lines

Such a point was established at the Royal Greenwich Observatory, built in 1675 on orders from King Charles II, and located in Greenwich, England. Because the observatory marked the point of zero time, time became known as Greenwich Mean Time, or GMT. The definition of the word *Mean* is *indicate,* or the time indicated at Greenwich. And since the sun travels from east to west, time would "travel" to the west from Greenwich.

In the early part of the 1700s, the British Board of Longitude offered a prize for the most accurate clock. In 1734 a clock was submitted, but it wasn't until 1761 that it was actually tested on a sea voyage. The clock was large and heavy, but accurate. Its time was so accurate that at the end of a 3,000-mile voyage the ship was off course only 1/50 of a degree, or about 1 mile. This clock was the first chronograph, a type of clock that shows time in days, hours, minutes and seconds.

As late as 1883, chaos in time reigned supreme. Time varied from city to city, state to state and country to country. It was not unusual for a state or city to operate with two or three different times. But thanks to the railroads in the United States and their efforts to run on a "standard time," order came out of disorder. In October of that year, a convention was held that divided the United States into four time zones. Later that year, an international convention divided the world into 24 time zones, and in the next year, 1884, the International Date Line was drawn.

The date line is based on the 180-degree meridian of longitude. A look at a map of the world will show that the meridian is on the opposite side of the world from the Greenwich Observatory. The date line zigzags from the North Pole, through the Bering Sea and between the islands of the Pacific Ocean, to the South Pole. Because the line does not pass through any land mass, no country will have two different dates. It was agreed at the conference that a day would start west of the line, and end east of the line, but time would not be affected. For example, Saturday, March 5th, east of the date line, is Sunday, March 6th, on the west side. And if it is noon on the date line, in the time zone east of the line it is 1 p.m., and in the time zone west of the date line it is 11 a.m.

Despite all international agreements, even today some countries do not use time zones; time in all parts of the country is based on the time used in its major city.

### 24-Hour Time

Twenty-four-hour time was established to prevent mistakes between a.m. and p.m., in any time zone, and to be used as a worldwide standard time. Time under this system starts at midnight at Greenwich. Hence, 1 a.m. at Greenwich is 0100 hours, and 12 noon is 1200 hours. After 12 noon the time is found by adding the p.m. hour to 12 noon. Thus, 5 p.m. is 1700 hours, and 11 p.m. is 2300 hours. If the time is 1:52 p.m. it becomes 1352 hours.

However, in some locations many quasi-government agencies and business firms operate on a 24-hour time based on local midnight. The majority of police and fire departments in this country use local 24-hour time. This is done to eliminate mistakes in written reports and avoid confusion in radio transmissions. However, national and international communications used by the government and some businesses, whether written or radio, are in international 24-hour time. Most radio amateurs also use this system of time.

### UTC

The observatory at Greenwich was closed in 1958, and its duties as timekeeper for the world were taken over by the International Time Bureau in Paris, France. Greenwich Mean Time is now known as Coordinated Universal Time (UTC). The time is derived from astronomical measurements collected from observatories and governmental scientific agencies around the world, which the Bureau combines with atomic clock readings.

Since scientists now delve into things where fractions of seconds are necessary, it might be interesting to know how long a second lasts. The length of a second is based on the rotation of the earth on its axis, and on its orbit around the sun. Previous attempts had been made to arrive at a standard for the second but they proved impractical. In 1956 it was decided that the second would be based on the orbital year: the rotation of the earth around the sun. But the rotation of the earth on its axis is slowing down at the rate of one half-hour every 1,000 years, so corrections for this have to be made, thus making a second 1/31,556,925.9747 of an orbital year.

Now you have a better understanding of time: how Greenwich Mean Time came into being, how the International Date Line and time zones were created, and why 24-hour time is used in radio communications. RF

## Fascination and Encumbrances

**Continued from page 20**

what? I didn't know so much stupidity would fit into one head, or even into two. I thought amateurs were at the forefront of technological advances, but not these guys.

Certain things bother me. One is misuse of the phonetic alphabet. "Zed" instead of "zulu" is worst. Cessna 5678Z ends with "zulu." A pilot who says "zed" to a control tower might wait a long time for clearance. In Army basic training, we had to know the phonetic alphabet. Had I said "zed" to a drill sergeant I'd still be doing pushups. Deservedly, too.

The phonetic alphabet is bigger than amateur radio, not the other way around. "Zed" is incorrect and won't come from my mouth. Other letters suffer too—"Adam" for "Alpha" and so forth. This is one of the closest things in amateur radio to CB slang.

"Clear on your final" is a strange way to sign off. I'm not clear on your final—I'm clear as soon as I say so. *You* will be clear on your final.

List-keeping does not interest me. I'll keep a logbook as a personal record but not to tabulate the number of states, countries, or redheads I contact. Some say they "need" certain states or countries. I don't. I need interesting people to communicate with.

"Radio travel" is exciting too. On HF one evening, I heard an amateur who was spending the night in an abandoned cabin near Death Valley, California. He'd stretched a longwire across some bushes for an antenna, though Death Valley has a dearth of bushes. He was talking with another ham in Bridgeport, California, a beautiful place just east of the Sierra Nevada range, and with a third near Yosemite National Park. Another transmission came from northern Michigan near the Mackinac bridge. This wasn't quite like going there but at least the simulation occured at the speed of light.

Some of us here have provided communications for marathon and kayak races. Mostly for safety reasons, we kept track of participants as they ran or paddled by. The interest lay in doing something that needed to be done.

Back to the central mystery. Most signals that reach my antenna are not just intelligible. They are intelligent as well, with disappointments here and there. For the most part, amateur radio is what I thought it would be: fun, satisfying, adventurous—and quite mysterious. RF

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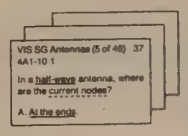


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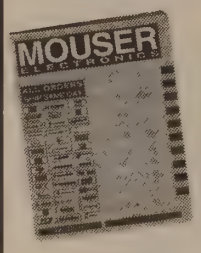


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# the tech side

**by Michael Jay Geier KB1UM**

## All Those Buttons!

Recently, a reader wrote in to the "Letters" page and asked a good question: What are all those buttons on HTs for? As a new ham, he was confused by all the options and settings on his walkie, and that got me thinking that perhaps others had the same problem. So, for the next few columns, let's take a look at modern walkies and their operations.

## Flavors

Most walkies are made by either Icom, Kenwood, Yaesu, Standard or Alinco. As far as I know, the first three manufacturers account for the majority of HTs sold in this country. Alinco has been around for quite awhile, though, and has sold plenty of radios. Standard's presence has been increasing, too. Oh yeah, there's also Radio Shack, with its HTX series of handhelds.

The standardization issue with today's walkies is like that of computers 15 years ago: There is none! Remember when Apple, IBM, Osborne, Atari, Tandy and Commodore all had different operating systems, none of which much resembled the others? Sure, many of them did pretty much the same thing, and you could word process on any machine you wanted, but Commodores and Apples couldn't talk the same language, and neither could their owners! Although the features of the various HTs overlap quite a bit, every maker has a different way of presenting them. What's worse, even within a given manufacturer's line, different models can operate very differently. Is there a "best" way to do it? I think so, but I don't think *any* walkie maker has gotten there yet. To me, the ultimate HT operating system would use a full dot-matrix alphanumeric display and menus for everything, in plain English, with *no* cryptic icons or letters on either the display or the keypad. Also, odd keypress sequences like "hold the lamp switch while pressing the CALL button for two seconds, being sure the transceiver is in memory mode first" would be nothing more than unpleasant memories. How close are we? While dot-matrix displays are finally starting to be used, there are still plenty of things like "OW" and "TS/M" on keypads, and the displays still have little "M," "TSQL," and other hard-to-remember icons on them. And the dreaded weird sequences are more in use than ever before. So, until somebody comes up with a Macintosh-like HT with pull-down menus or something, we'll just have to live with it all as it is.

> ***"The standardization issue with today's walkies is like that of computers 15 years ago: There is none!"***

## What's The Big Idea?

Why are HTs so darned complicated? The answer is much easier than the radios' operations: There are just too many features to fit on too few buttons and too little display space! In order to outdo each other, walkie manufacturers have been adding frills as fast as they can think them up. Most features center around the digital part of the rig and cost the makers little or nothing, because they are software-based. After all, the radios are controlled by microprocessors, so what's the big deal to add a few more lines of code and make the radio sit up and beg? It sure looks good in the ad when your model can do something the other guy's can't. Does that mean all that stuff is garbage? Not at all! Some of the new features are useful and fun, while others can be forgotten about with no loss of function of the radio. I, for one, wouldn't want to go back to a rig with no memory storage, or one which didn't scan or didn't have CTCSS (continuous tone-coded squelch system). I also like the new DTMF (dual-tone multi-frequency) autodialers, which let you make phone calls on the autopatch (automatic repeater-to-telephone line interface) with one or two keypresses. Ditto with automatic repeater offset, which sets your transmit offset above or below your programmed receive frequency, depending on the standard American band plan. And I absolutely love battery saver systems, which save a great deal of power by putting the radio to sleep and "waking" it every fraction of a second to check for activity on the selected frequency. On the other hand, I don't know anyone who actually uses the message paging and other DTMF-based selective calling features most new walkies include. Heck, most repeaters won't even pass the required tones from their receivers to their transmitters, so the features won't work through them. As far as I'm concerned, DTMF paging capability is a waste of money. Some features, of course, may appeal to me but not to you, or vice versa. I don't care for automatic power shutoff, but I've met others who swear by it. That's what makes the world go around, I suppose.

To give you all those features in such a small box with so few buttons, walkie makers have developed operating systems which have evolved over the years as the features have increased. There's no way I could cover every option on every rig from every manufacturer. So, instead, I'll describe the functions themselves and, in some cases, leave it up to you to look in your rig's manual and see what the manufacturer called them and where to find them on your keypad. Let's start with the major functions and work through them, heading toward the more arcane ones last. That way, you can be enjoying your new HT sooner.

## Lemme At It!

The function of any HT is to let you talk to somebody else, right? So it would seem that all you'd need would be to enter a frequency and start talking. At one time, that's really all there was to it! Actually, early handhelds had separate crystals for each channel, along with a rotary knob to select among them. That made it easy to pick a frequency, but you had only a few from which to choose. When frequency synthesis came along, allowing frequency agility without crystals, most walkies had thumbwheel switches for frequency entry, and there were no memories; you just had to reset the thumbwheels when you needed to change frequencies. Then repeaters got popular, so you needed to be able to set a transmit offset; you couldn't transmit and receive on the same frequency, or the repeater's transmitter would wipe out its own receiver! The standard offset on the 2 meter band in the United States was chosen to be 600 kilohertz (kHz). That is, your transmit frequency would be 600 kHz away from your receive frequency. Depending on the chosen frequency, though, the offset could be above or below the receive frequency. We refer to that as transmitting "plus" or "up" and "minus" or "down." Any time you hear someone say that the repeater is on "145.47 down 600," that's what it means. In fact, the 600 may even be omitted, as it is assumed unless otherwise stated. Yes, there are some non-standard repeaters these days, but their numbers are still very small.

Today's HTs usually let you enter the frequency directly from the keypad, calculator-style. Some require you to enter only the last four digits, while others need five or even all six digits. And, some offer optional wideband receivers, the enabling of which may change the entry sequence. For instance, some require only the last four digits when delivered; they can't go outside the 144-148 MHz range, so why make you enter the first 1 and 4? Once you perform the modification to enable, say, 130-174 MHz reception, then you must enter the 3, 4, 5, 6 or 7 as well. It makes sense.

When you enter the frequency, most radios make you first select VFO mode, as opposed to memory mode. What's a VFO? It stands for variable frequency oscillator, which was what was used in olden days to tune radios. The name has stuck, but today's VFOs are fake; they're really just software registers like the memories, but they *behave* like VFOs in that you can easily change them, and that's what counts. By contrast, memory channels normally aren't tunable—you have to reprogram them after first setting the frequency in the VFO. Some HTs, though, do let you tune the memories, at which point they are no different at all from VFOs.

Pretty much all new rigs also program the offset into memory, rather than using a slide switch to select it like the thumbwheel sets did. Why? Because you could have different offset directions for different memorized frequencies, and this method lets the radio remember and automatically set them when you switch memories. It's a very nice feature. The button may be labeled RPT (for "repeater"), OFFSET, SHIFT, or DUP (for "duplex"). On many radios, the correct offset will automatically be selected when you enter the frequency; if the repeater conforms to normal standards, you don't have to do anything at all. On the display, a "+" or "-" shows you what's been selected. Also, when you transmit, the display will change to the new transmit frequency, enabling you to confirm that the shift is in the right direction. Of course, if you want no offset for simplex operation (communicating directly with another radio, on one frequency, with no repeater), you can have that too. In that case, no "+" or "-" will appear, and the frequency will not change when you press the transmit button. Next time, we'll continue with this discussion, delving ever further into the world of HT operation. Until then, 73 from KB1UM. RF


# radio magic

by Michael Bryce WB8VGE

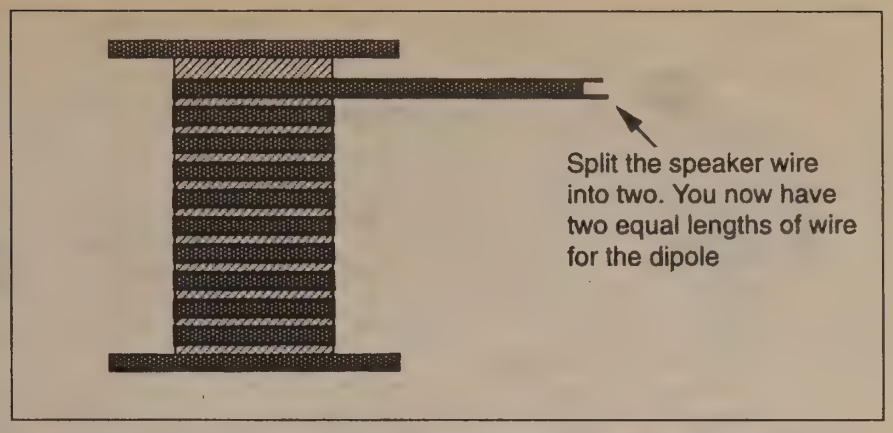


**Figure 2. A 25- to 50-foot spool of really cheap wire from Radio Shack is ideal.**

As promised, this month we'll look at my favorite Field Day antenna. I've used this guy in the past, and continue to use the very same antenna today. In fact, this year I'll be using a complete home-brew QRP station running on 100-percent solar power. However, I have not been able to figure out how I'm going to make that happen at night!

Anyway, the number one item in any Field Day endeavor is the antenna. In fact, some clubs set up more than a dozen different antennas. These range from "death ray" killer wire beams to multi-array VHF antennas. I prefer something simple, easy to erect, and cheap. What you end up with is my world-famous "McGyver" dipole.

## The Parts

Nearly all the parts can be picked up around the home or shack. If you are one of those sick ultra-neat people with a perfectly arranged and tidy garage, then a trip to the local Radio Shack will provide you with all the fixings for your Field Day antenna. This antenna is really just a center-fed Zepp. It's how it goes together that makes it work.

The first thing you need is a coil of wire. Not just any wire, but any wire. Confused? I don't want you to go and spend your bucks on special antenna wire. *Any* type of wire will work. I've used steel electric fence wire, telephone wire, speaker zip cord wire, and even baling wire. Of course, if you can solder to the stuff, that's even better. You can't solder to the electric fence wire—it's made of steel. The same goes for the baling wire.

If you don't have easy access to a wad of wire, Radio Shack handles spools of cheap speaker wire. Pick up a spool of the cheapest stuff they have in stock. I do mean the cheap stuff—you don't want or need a lot of plastic insulation on the wire. The insulation has no effect on the RF coming out of your transmitter, but it does make the wire heavier to support. Make sure the spool has at least 25 feet of wire. The more, the better. A 50-foot spool is ideal. You will also need a spool of very cheap 300-ohm TV twinlead. Again, get the cheapest you can lay your hands on. Before you leave the Shack, pick up a roll or two of electrical tape.

As you drive home, stop at the local discount junk store and pick up a roll or two of cheap duct tape. Don't get masking tape or electrical tape. You need duct tape.

The next item on the list is a large roll of twine. Get twine, not cord and not rope, but twine. A 500-foot ball should be under two bucks.

You will also need two six-packs of your favorite liquid refreshment. Get the six-packs, and not a carton of 12. You'll see why later on as we build our Field Day antenna.

## Construction

Once home, construction begins by opening the six-pack. You want the plastic ring holding the pack together. This will become our center insulator. Folded back on itself, that ring is mighty tough to pull apart. Now, take the spool of wire and separate the two leads. (This only applies if you're using the speaker wire. If you have a different type of wire, then connect one end up to the plastic ring.) With one wire tied to the plastic ring, take the other wire and connect it to the other side of the plastic ring. Now, connect one wire of the TV twinlead to one of the wires. Connect the other side of the TV twinlead to the remaining wire. Use the wires to hold the plastic rings together as one. So, after you are done, one side of the TV twinlead should be connected to one of the speaker wires and the other side of the TV twinlead should be connected to the other wire.

Now break out a large soldering iron and solder the connections. If you don't have an iron with enough wattage to make a good secure connection, then use electrician's pliers to twist the connections as tightly as you can. Use some of the duct tape to insulate the connections and to prevent them from touching each other. Right now, the speaker wire is still on the spool. Do not unwind the wire.

By now you should be down to your last cold one. Time to break out the other six-pack. This time take the plastic ring and divide it in half. You want to have three rings folded back on themselves, one set of plastic rings for each leg of our dipole. These will become our end insulators.

Now the fun begins! Unwind the wire from the spool, splitting it apart as you do. This way, you will end up with two equal lengths of wire. Tie either end to the plastic end insulator made up from the six-pack plastic ring. Do the same for the other end. Now we have the center insulator with the wires connected and the opposite ends attached to end insulators.

Get out the ball of twine and tie a secure knot to hold the twine at the top of the center insulator. The antenna will be hoisted up using this twine. Or, depending on what you end up using to hold the antenna, a small run of this twine will be used to hold the antenna away from the support.

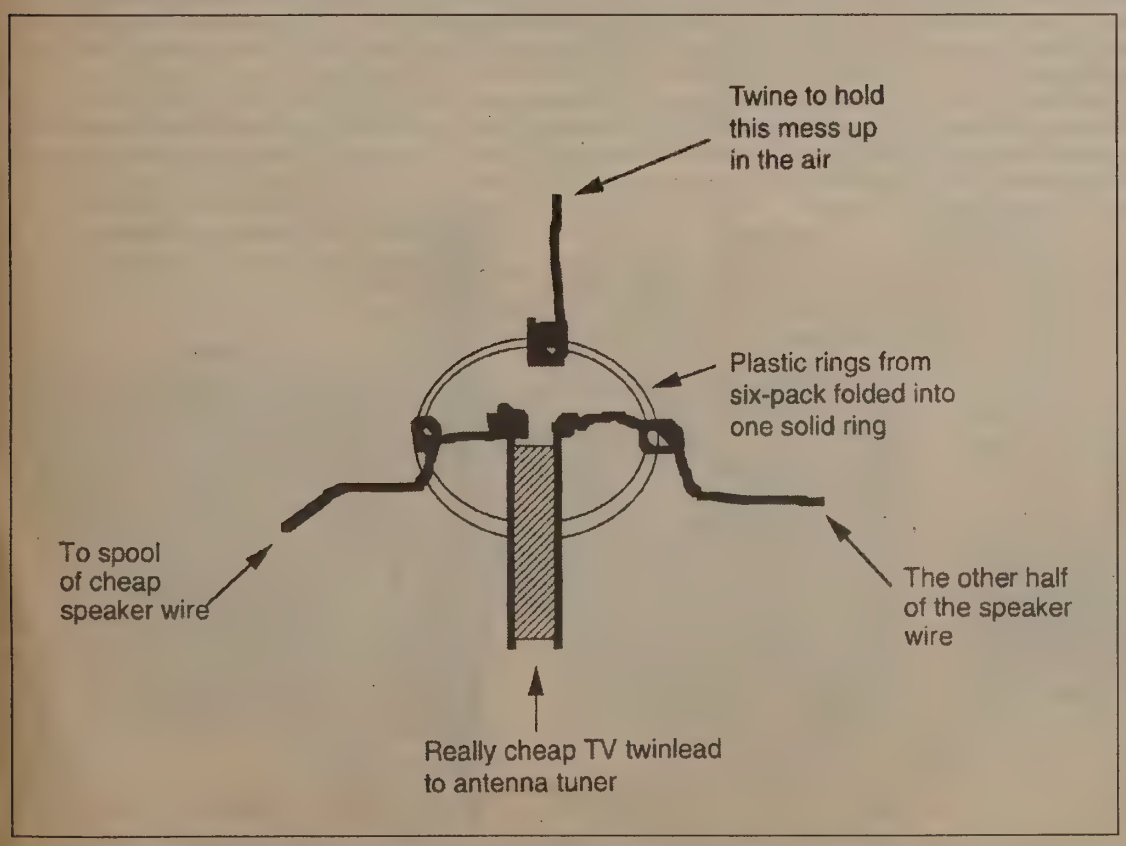


**Figure 1. Wrap up this entire mess with electrical tape. Solder the connections if you can. Otherwise, twist the wires together as tightly as possible with heavy-duty pliers.**

## Antenna Supports

You have several choices for what to use to hold up your antenna. The choice depends on the location you have picked for Field Day. A location full of trees is ideal. Even one small tree is fine. If the area lacks these natural antenna holders, then you must supply your own supports. I've used everything from stepladders to cardboard shipping tubes. The cardboard shipping tubes don't cut it during a rainstorm, by the way! If you have but one small tree or even a fence post, that's great. All you need are some broomsticks, two-by-twos, plastic pipe, old wood molding, chair rail, or whatever you have, and your roll of duct tape. Overlap whatever you have by several feet and tape them in place with the tape. You can get at least 25 feet in the air using this method. Attach the center of your dipole to the top of the whatever with about a foot of twine. Raise the whatever up in the air by the ends of the dipole. If you use a fence post or small tree, tape the whatever to the post or tree with the duct tape. Wind a lot of tape around the mess to hold it in place. Remember, boys and girls, this thing only has to stay up in the air for 24 hours! I operated one year with my antenna supported by a shovel pushed into the ground.

Use the twine to support the ends of the antenna. The antenna also helps to support the whatever you used to hold this mess up. Now, run the feedline down to your antenna tuner and keep the feedline as far away from the support as you can. Cut off any excess feedline. You don't want to have the feedline laying around on the ground. All you have to do now is fire up the rig and adjust the tuner for the lowest SWR. Now you're ready for Field Day.

After Field Day is over, the whole mess comes down. Take the tape off of the tree or fence post, put the broom handles back on the brooms, and then safely dispose of the plastic rings. The wire goes into the junk box for another project.

As goofy as this sounds, the antenna works very well. Of course, as we used to say in the sixties, "the higher the better," but even at 25 feet or so with 5 watts of RF, you'll have a great time.

Field Day is supposed to be emergency communications in the rough. When the "big one" hits, your skill in assembling a McGyver antenna like this may be worth a lot more than you may think. RF

# antennas, etc.

by Joseph J. Carr K4IPV

### Getting It Inside

Whether you operate VHF or HF, whether you are a ham or SWL, there is one common aspect of your hobby that you share with all the rest of us: You need an antenna. In most cases, that antenna will be erected outdoors—on a roof, between the house and a tree, on a tower, or attached to the outside wall. But however you mount the antenna, if the "shack" is inside the house you'll need to find a way to get the transmission line from outside to inside. Here are some suggestions.

### The Cinder Block Route

Figure 1 shows the construction of typical cinder blocks. The side view might make you think that it's a solid piece of rock but, if you look at a top or bottom view, you will find that the interior of the block consists of two hollow chambers. There is a solid rib between the two chambers. This limits the pathways through the cinder block. The areas where you can pound a hole in the block are shown marked with an "X." These spots can be found easily enough:

1. Find the mid-point of the block, dividing it into two halves (side view).

2. Locate the mid-point in each half of the block. Each of these spots are reasonable candidates.

Making the holes in the block can be easy, or it can be hard. The difference is in the tools you select. A long carbide 1/2-inch drill bit will make short work of the block ... if you have the electric or pneumatic drill to drive it (and know how to use it). Otherwise, go get a star bit. These tools are shanks of steel that have a star-shaped bit on one end and a banging surface on the other. You hit it with a hammer, turn it, hit it with a hammer, turn it, hit it with a hammer... until you break through into one of the inner chambers. Then you push the bit through the chamber until it touches the other side, and then you hit it with a hammer, turn it, hit it with a hammer, turn it, hit it with a hammer ... until you break through to the inside of the house.

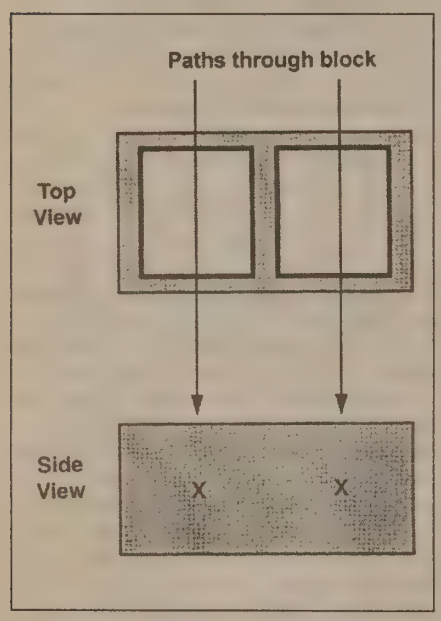


**Figure 1. Views of cinder block showing candidates for coax routes.**

*Warning:* Don't even think about using either an electric drill or star bit and hammer without wearing safety goggles. Little bits of sharp, shrapnel-like cinder block fly in all directions. They can take your eye out...and I saw it happen to an antenna technician a few decades ago... it really happens.

There are right ways and wrong ways to bring the coax into the house, once the hole is drilled in the cinder block. Figure 2 shows the wrong way (left side) and right way (right side). The wrong way brings the coax in from above, while the right way lets the cable drop below the insertion point a foot or so, and then comes back up. Why? The right way is to provide a drip loop to allow rainwater to roll off onto the ground instead of inside your house. That little bit of wisdom can save you some expensive repair bills!

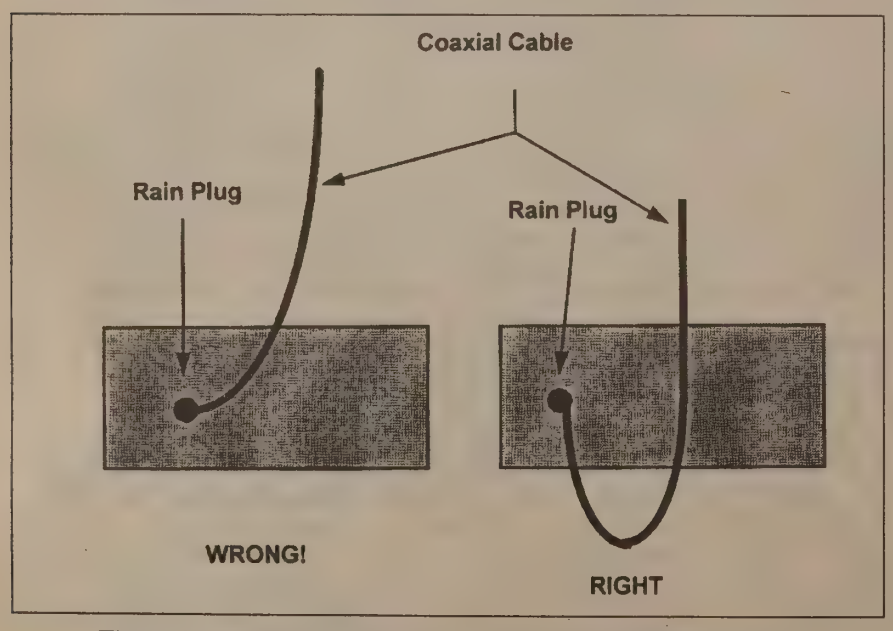


**Figure 2. Right and wrong ways to take coax through the wall.**

The hole in the cinder block will most likely be quite a bit larger than the coaxial cable. You can buy a rain plug to fit into the hole, taking up the excess space (preventing rainwater from the wall from getting inside). You can also plug the hole with silicone sealant, caulk, or some other similar material. It's probably a good idea to use the sealant even if you get a rain plug... and seal it thoroughly.

If your house is made of brick or fieldstone, a different problem asserts itself ... a real ugly one. If you attempt to pound your way through a brick, especially an old brick, then you'll work all night long making that dang hole. Try drilling in the mortar between the bricks or stones, rather than through the solid body (sigh).

### Window Entry

Figure 3 shows how to bring the coax through a window that can be raised and lowered. Cut

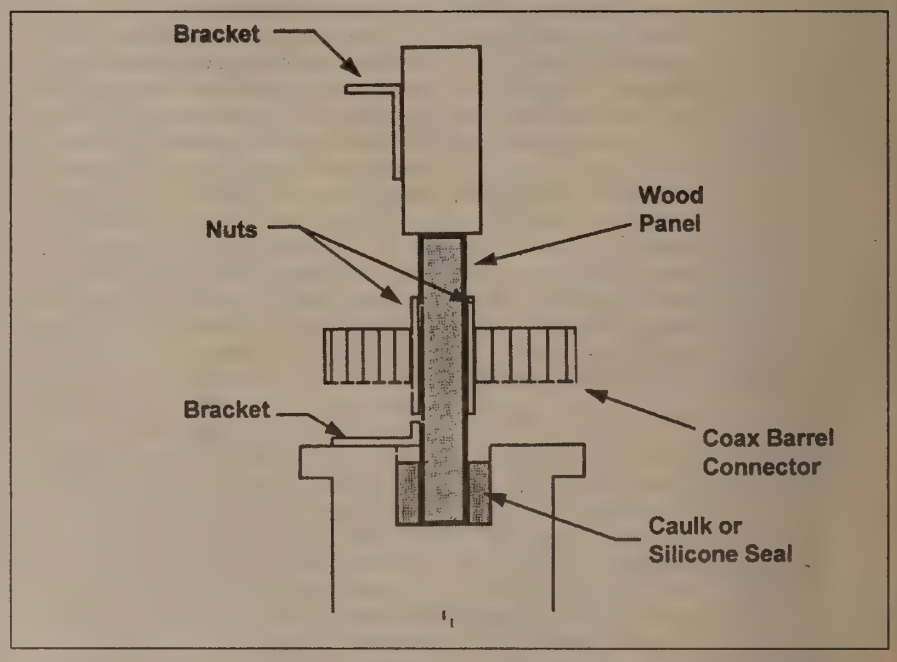


**Figure 3. Using a wooden panel under a window sash to route the cable.**

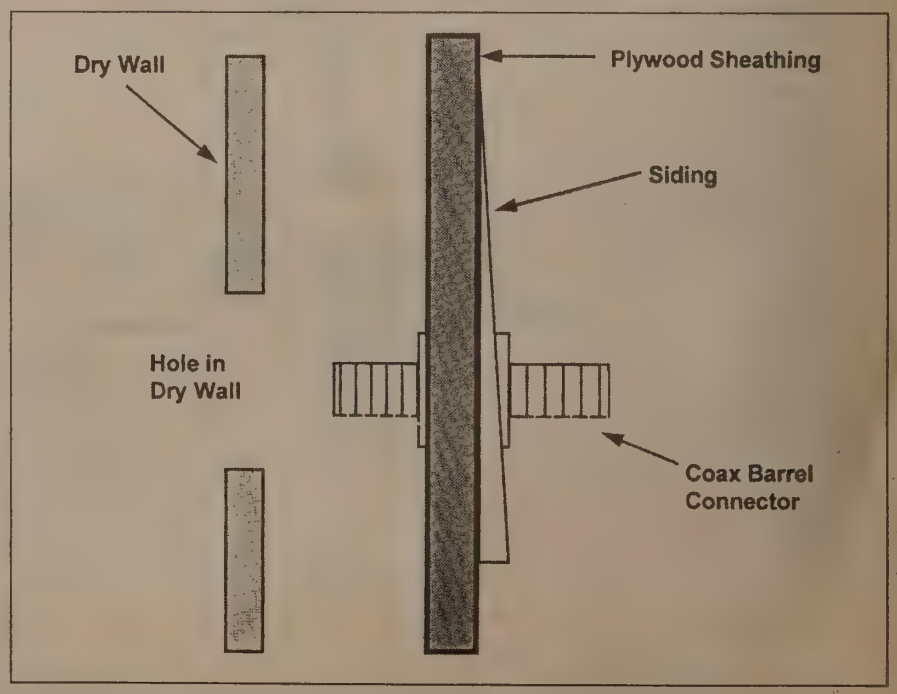


**Figure 4. Installing coax through the wall of a wood frame house.**

a piece of 1/2-inch-thick wood paneling, six to eight inches high and as wide as the window. Make it a snug fit. Drill a 5/8-inch hole in the wood at a convenient point and install a female-female coaxial "UHF" barrel connector on the wood panel. This connector accepts a male PL-259 "UHF" coaxial connector on each end. If you install a PL-259 on the downlead from the antenna, and another one on a length of identical coaxial cable to the rig, then this connector will interconnect them. Neat, huh?

Two or more security brackets should be installed to prevent the window from being raised. You don't want some dirty, smelly bad guy raising your antenna cable installation and then climbing through the window to steal your rig, your dog and your Smith & Wesson. One bracket should be fastened to the wood panel and the windowsill. Another bracket should be fastened to the movable portion of the window and the window frame.

You might also want to caulk the edges around the wooden panel to prevent rainwater from entering through the window. Ordinary window caulk will do nicely, and is only moderately messy to remove when you want to restore the window to normal operation. It will also take most forms of paint that are normally used for outside windows.

Another way to go through a window is to remove one of the glass panes and replace it with either Plexiglas or a thin piece of plywood. The coaxial connector barrel connector (used in Figure 3) can be mounted to the replacement pane. Either can be installed with normal window-glass putty. Plexiglas would allow you to look through the window pane, but is harder to work with—it often shatters when you drill a hole in it.

### Wooden Frame Houses

Figure 4 shows the way to get through a frame house, like mine. The inner wall will be made of dry wall material, while the outer wall will be plywood sheathing covered by either decorative paneling or (more commonly) aluminum or vinyl siding. The space between the inner and outer wall will be about four inches or six inches, depending on whether 2x4 or 2x6 lumber was used for framing studs.

You must find a spot to drill that won't land you smack dab on a stud. Knocking with your knuckles will often reveal these spots, but a better way is to look for evidence of nails (which tend to be pounded into studs, rather than thin air). Cut a hole in the dry wall large enough to work through (about four inches is right for me). Find a spot on the inside of the outer wall that is about in the middle of the hole. I prefer at this point to drill a tiny (1/16-inch) pilot hole, then push a foot-long piece of hook-up wire through it. I then go outside and locate that wire to make absolutely and positively sure that the hole is where I thought it would be. Only then do I drill the 5/8-inch hole for the barrel connector.

When installing the barrel connector, cinch it up tight enough to hold, but not so much that it wrecks the siding. Seal it with caulk or silicone seal to prevent rainwater from entering. You might find it necessary to have someone on the other side of the wall with another wrench to keep the hex nut from rotating instead of tightening.

*Warning:* When routing coaxial cable either inside or outside the house, *do not cross over electrical wires.* A severe electrical shock could result ... and it might be fatal.

### Conclusion

Installing antennas requires routing the feedline from outside the house to the inside. The techniques discussed above will permit you to do that job more easily. RF

# what's next?

**by Carole Perry WB2MGP**

**Photo A. 15-year-old Allison Zettwoch KD4CKP (center) flanked by Burt Hicks WB6MQV (left) of *Westlink Report* and Bill Pasternak WA6ITF (right) of Newsline, at Sea-Pac '94.**

### Young Ham of The Year Award

In the spring of 1990 an event took place which was a high point in my teaching career, as well as being a highlight in a student's life. Mary Alestra KB2IGG, a seventh-grader at the time, won the "Young Ham of The Year Award." Mary was one of the brightest and most articulate young adults who had come through my ham radio program. She seemed like a perfect choice to nominate for the award. We were all so excited for her at our school when she was notified that she had won.

There is little doubt that when a youngster receives a national award or recognition, it has a big impact on his or her life. As you read about the qualifications for this award, think if you know of a deserving young person you can nominate.

The nominating period for the 1995 "Young Ham of The Year Award" is now open. Originally known as the "Westlink Report Young Ham of The Year," this award program, now entering its ninth consecutive year, is presented annually to a United States licensed radio amateur (ham) who is 18 years of age or younger and has provided outstanding service to the nation, to his/her community, or to the betterment of the state of the art in communications through the amateur radio hobby/service.

The award was conceived in 1985 by then-*Westlink Report* Editor-in-Chief Bill Pasternak WA6ITF. His desire was (and still is) to highlight the accomplishments of the nation's many young radio hobbyists, and to encourage the entry of more young people into the exciting and rewarding hobby of amateur radio.

Bill has been a good friend of mine for many years, and he is always on the lookout for interesting young adults to put in touch with me. Through the years, we have worked together not only looking for award nominees, but to encourage and help network children from all over the country as well. Bill is a tireless worker for the betterment of amateur radio, and especially for recruitment of youth. We as hams owe him a lot for finding a way to honor the achievements of children.

### Amateur Radio Newsline

With the recent absorption of the *Westlink Report* readership base into *WorldRadio* magazine, Bill decided to continue the award under the banner of his own "Amateur Radio Newsline" organization in the hope that this real-life experience will lead the award winner and many other young hams into careers in the sciences and technologies.

"We're not just looking for a youngster who passed a license exam," Bill told me. "We're looking for a young adult who is involved out there doing things, and helping other kids to get involved with radio."

Corporate underwriting for the "Young Ham of The Year Award" program has traditionally been supplied by Yaesu U.S.A. Corporation. Yaesu, a world leader in the design, manufacture and distribution of high quality amateur radio and commercial two-way radio equipment, has long recognized the importance of the nation's youth to the continued vitality of the Amateur Radio Service. The continued support of this award by Yaesu has been well received within the amateur radio community, which is competing with other technical hobbies and specialties for the interest of young people.

Yaesu U.S.A. Corporation has been joined by *CQ* magazine as a corporate underwriter of the 1995 Newsline "Young Ham of The Year Award." *CQ* Publisher Richard Ross K2MGA says the award is "very worthwhile for the future of the Amateur Radio Service" and has pledged *CQ*'s support and assistance in publicizing the award.

Past recipients of the award include: Shawn Alan Wakefield WK5P, of Bartlesville, Oklahoma (1986); David Rosenman KA9PMK, of Muncie, Indiana (1987); Jonathon Binstock NK3D, of Potomac, Maryland (1988); Erin McGinnis KAØWTE, of Topeka, Kansas (1989); Mary Alestra KB2IGG, of Staten Island, New York (1990); Richard "Sammy" Garrett AAØCR, of St. Louis, Missouri (1991); Angela (Angie) Fischer KBØHXY, also of St. Louis (1992); Kevin Boudreaux N5XMH, of New Orleans, Louisiana (1993); and Allison Zettwoch KD4CKP, of Louisville, Kentucky (1994). Many of these youngsters have spoken at youth forums across the country with me. Several of these past winners will be doing presentations at the Dayton Youth Forum in April. Please stop by to say "hello."

All nominations must be submitted before the extended filing deadline of June 30, 1995, and must be on an official application available for a SASE. Write to: 1995 Young Ham of The Year Award, c/o Newsline, 28197 Robin Avenue, Saugus, California 91350. Official applications are also available electronically with an E-mail request to BILLWA6ITF on America Online; B.Pasternak on GEnie, or billwa6itf@aol.com via the Internet. Applications can also be downloaded from the America Online and GEnie ham radio BBS software libraries.

### The Award

The Huntsville Alabama Hamfest has just announced that it is going to become the permanent home of Newsline's "Young Ham of The Year Award." The winning youngster will receive an expense-paid trip to the Huntsville Hamfest, and possible other amenities, courtesy of Yaesu U.S.A. Corporation. While in Huntsville, the winner will be provided with a *CQ*-magazine-sponsored V.I.P. tour of the NASA Spacecamp facility and the Marshall Spaceflight Center.

The 1995 winner will receive his/her award at the Huntsville Hamfest Grand Banquet on the evening of August 19, 1995. For more information, please contact Bill Pasternak at (805) 296-7180. RF

**Photo B. Presenting YHOTY '94 is (left to right): Harold Christenson of Yaesu USA, 1994 Young Ham of The Year Allison Zettwoch KD4CKP, Bill Pasternak WA6ITF of Newsline, at Sea-Pac '94.**

# upgrade . . . don't stop now

by Gordon West WB6NOA

## Intro to Amplification

Need more "punch" on the 2 meter band? Thinking about adding a power amplifier to your base or mobile system for added watts out? Or is there any way to amplify your voice on the band so you can be heard better at the other end of the circuit? Read on—but don't be surprised when hams frown at you when you tell them you are considering *an amplifier.*

RF power output can be amplified through the use of a 2 meter power amp. In the amateur radio service, power amplifiers are 100 percent legal up to 1,500 watts output. In CB radio, linears are "taboo." If you refer to a linear amplifier as a "power amplifier" on the air, rather than simply a "linear" or "foot warmer," other hams won't think you came straight off of Channel 19. Say it with me slowly: POW–ER—AMP–LIFIER. Refer to it as that.

For amplifying your voice, speech processor microphones are available for base station use, and these microphones also have up-and-down scanning buttons, graphic equalization, momentary and locking PTT switches, and a large VU meter to insure you don't overmodulate. Refer to these microphones as "graphic equalizers," rather than using the CB term "power mike."

## Power Amplifiers

The following companies offer inexpensive mobile 12-volt DC power amplifiers for 2 meters:

Communications Concepts
Daiwa
Mirage
Naval Electronics
RF Concepts
RF Technologies
RF Limited
TE Systems

Each of these companies sells through popular amateur radio dealers, and you will see a listing of all the different power amplifier types in amateur radio dealer catalogs. A few companies, like RF Concepts, also produce dual-band amplifiers that will work nicely on dual-band handhelds for 2 meters and 440 MHz.

Two meter power amplifiers are not really necessary for the modern 25-50 watt mobile transceiver. You have plenty of power to work with, and, except for rural use, you don't need an amplifier to take you from 50 watts to 160 watts. If you can't get a good signal out, get a better antenna; forget the amp for now.

But little 2 meter handhelds can really enjoy a range boost on an external mobile antenna when hooked up to a modest power amplifier that takes 5 watts and pumps it up to 30 watts. It will cost about $5 a watt for amplification, so the typical 30-watt amplifier will set you back $150 new.

You will need a very healthy source of 12 volts DC to power your little 2 meter, 30-watt amp. During recent testing of the RF Limited HL-35V 2 meter mobile amplifier, we found that 5 watts input from our little handheld gave us almost 40 watts output, but only if we ran our red and black wires directly to the car battery. If we pulled power from the automobile voltage panel fuse block, the amp dropped to only about 27 watts output because of the lower voltage when the engine was not running. However, the HL-35V amplifier by RF Limited (Clear Channel Corp., Issaquah, Washington; 206-222-4295) did a fabulous job, and the amp was seen selling at about $100 new.

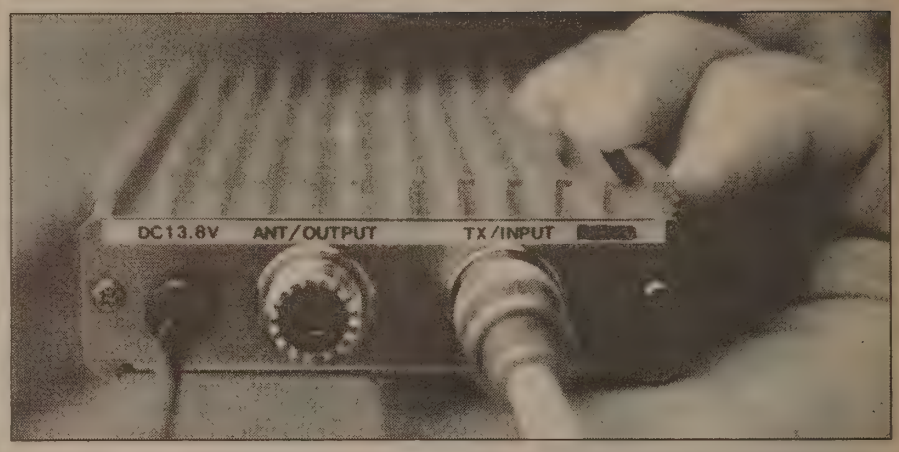


**Photo A. Be careful that power input from your 2 meter transceiver goes to TX/INPUT.**

The 2 meter mobile amplifier may also incorporate a switch to pull in a built-in 2 meter preamplifier using a sensitive GaAsFET transistor. In most cases, your little handheld will be plenty sensitive enough, and all the little preamp will do is introduce additional noise and intermodulation from other signals on nearby frequencies. Keep the receiver preamplifier turned off and your 2 meter transceiver will work just great on receive. If you click the amp "on" for additional power output, most stations will definitely hear an increase in your signal strength into a distant repeater, or on simplex. If you're working another station close-in, click the power amp off, and your signal will pass straight through the amp without any significant loss at all.

## Warnings

*Caution:* Make absolutely sure your radio goes to the amplifier input jack, and that the antenna comes from the amplifier output jack. If you get them reversed, you will blow your amplifier.

Don't overdrive an amplifier by hooking up a mobile radio that puts out 30 watts to the input of an amp that is only rated at 5 watts input. This will also blow the amplifier for good. You don't need a mobile amplifier for a 30-watt mobile in most cases. And if you do get one, make sure your 30-watt mobile is working with an amplifier that has an input rated at 30 watts, not 5 watts.

Finally, make sure your amplifier is well ventilated and double-check that you have at least 12.6 volts on the red and black wires feeding into the amplifier, with the engine running, during transmit.

## Microphones

If you operate a 2 meter mobile station at home using a base station power supply, you can amplify your modulation significantly to give your base station addi-

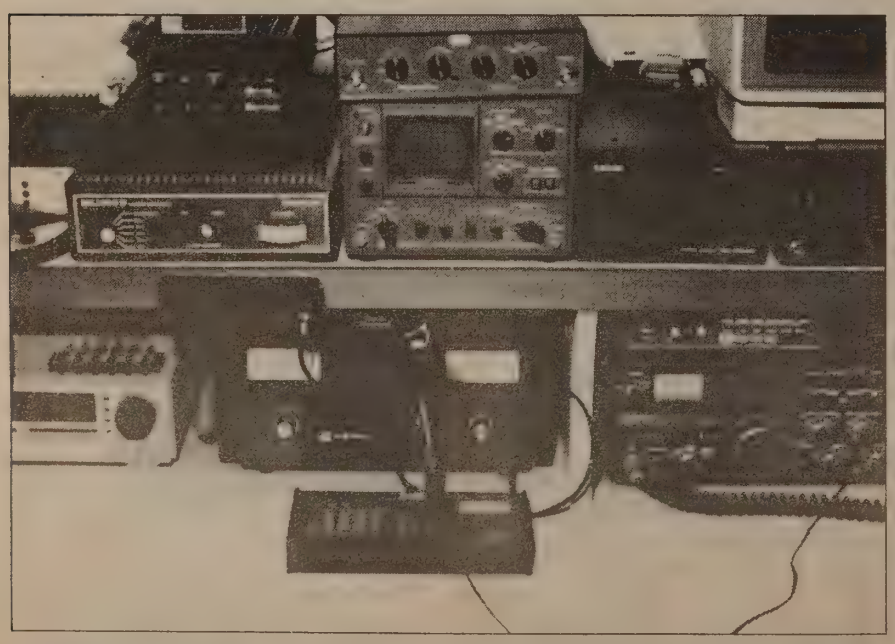

**Photo B. The Ranger AC-7000 base station mike shown in front, on the desk at the WB6NOA station.**

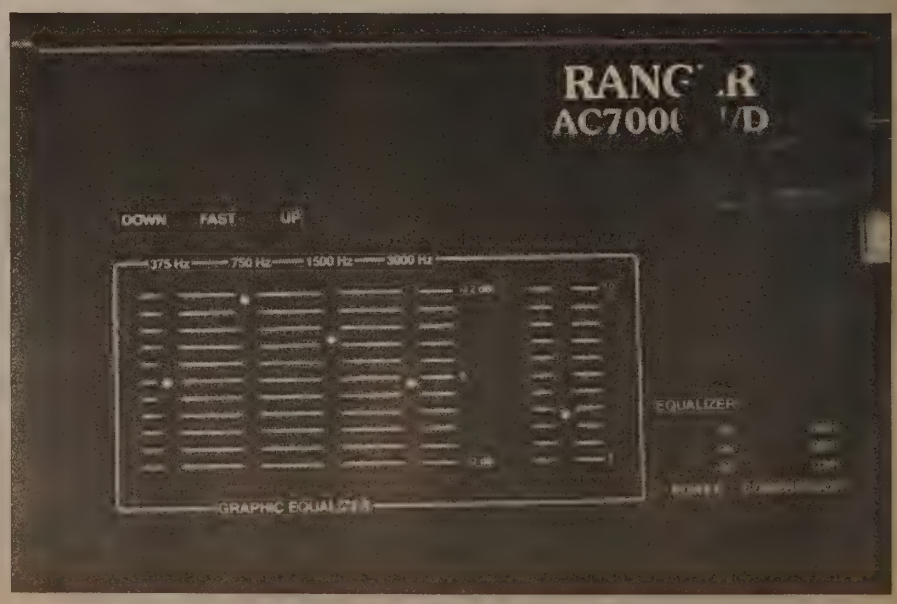


**Photo C. The graphic equalizer controls on the Ranger base mike.**

tional full-fidelity sound. Most mobile amplifiers are adequate for car use because of their noise-canceling internal element, but when you run a mobile mike at home, it sometimes will sound a bit flat.

But you don't want to over-amplify your voice either. Kenwood and Icom each have big base station microphones that work dandy on mobile VHF radios, and these mikes have a big VU meter and selectable amplification/equalization networks to allow you to adjust your voice modulation to where everybody on the frequency or repeater says you sound good. Echo circuits are not found in amateur base station microphones, nor would you *ever* transmit with an echo circuit kicked in on any ham band. Echo effects are absolutely out of place over amateur radio, and driving a base station microphone "too hot" is equally as bad over the airwaves.

Yaesu does not have an amplified equalization type of base mike. Yaesu does have a base station mike, but it doesn't have enough drive to adequately modulate many of their mobile VHF sets, or their popular FT-4700 dual-band mobile. But there is a cure—plug the Clear Channel Corporation Ranger AC-7000 U/D base station mike into your Yaesu (or any other brand set), and enjoy a full-featured base mike that will let you set your audio output to a level that everybody will enjoy over the airwaves. You must tell the company which radio you plan to use the mike on, to get the right radio plug. Only Alinco and Kenwood share the same type of plug; Icom needs its own type plug, and so does Yaesu.

If your 2 meter antenna is relatively close to the Ranger mike, you may also need to run an additional ground wire from the metal base of the mike to your base station ground system. This keeps RF from getting into the microphone circuit and re-amplifying itself into oscillation. At my station, at medium- and low-power settings, the extra ground wire was not necessary—but at high-power settings, the microphone would sometimes "take off" until the additional ground wire was added. We found this true with other brands of base station microphones with amplifiers—power output too close to the base station mike can sometimes lead to distortion or oscillation until everything gets an additional ground wire.

Double-check your communications system and see whether or not you need more power, or more audio. If you need one or both, power amplifiers and amplified equalized base station microphones are indeed available for all makes and models of amateur radio equipment. RF

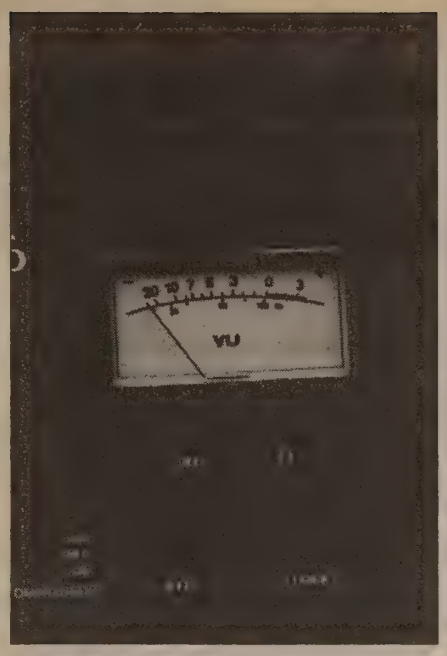


**Photo D. The big VU meter on the Ranger base station mike.**


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With the success of America in the next century dependent on our ability to provide high-tech career workers to deal with the information highway and the computerization of the workplace, amateur radio provides a fun way to ger kids interested in leaning about technology. It beats the heck out of Nintendo and Sega, which teach nothing. It even beats sports, which provide a good living for a handful of stars and disappointment and poverty for the losers.

We need to see radio clubs sprouting in our secondary and high schools again. We need to see hamming become a major activity in retirement homes and villages. We have room for millions of hams on our bands…of which we're using less than 0.2% today on any regular basis. Yep, that's right, 99.8% of our ham bands are just sitting there almost totally unused, with us waiting around for the FCC to sell them off and pocket the money without even a word of thanks.

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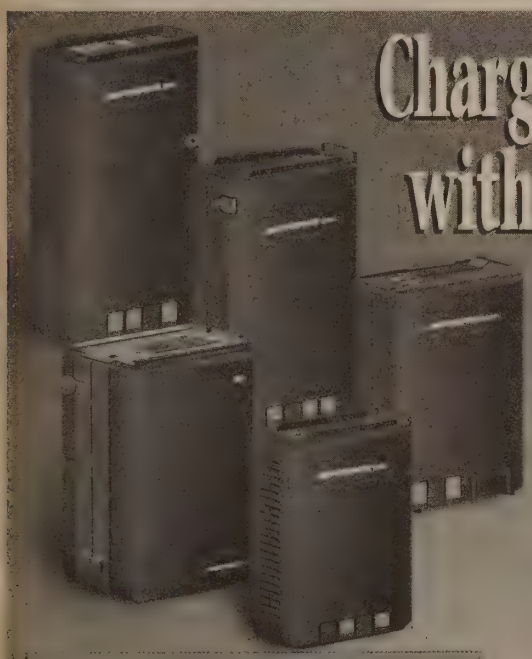

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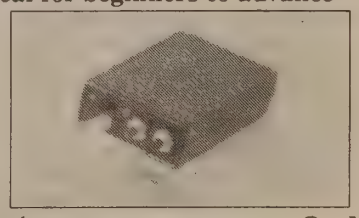

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Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 30,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar, and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The *Radio Fun Flea Market* costs you peanuts (almost)—comes to 25 cents a word for individual (noncommercial) ads, and 80 cents a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad. This is a monthly magazine, not a daily newspaper, so figure a couple of months before the action starts; then be prepared. If you get too many calls, you priced it too low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right, and maybe you can help make a ham newcomer or retired old-timer happy with that rig you're not using.

Send your ads and payment to *Radio Fun Flea Market*, Joyce Bocash, 70 Route 202 N, Peterborough NH 03458, and *get set for the phone calls.*

**Personalized** caps, T-shirts, mugs, mouse pads, license plates. Request free color brochure with designs. **Donovan Deily WA3B**, RD2 Box 2088A, Leesport PA 19533-9653. RF234

**QRP TRANSMITTERS**—3 watt kits and assembled models for 20m, 30m, or 40m. Easy, fun to build! 2 stamps for **"MILLIWATTER"** info. **TECHSONIC**, Plymouth PK-32F, Conshohocken, PA 19428. RF235

**1995 Nationwide Hamfest List** & News letter. $5 ppd. **"Hamfests '95"** Box 607, Hatboro, PA 19040. RF255

***MAHLON LOOMIS, INVENTOR OF RADIO;*** by Thomas Appleby, (Copyright 1967). Second printing available from **JOHAN K.V. SVANHOLM,** N3RF, **SVANHOLM RESEARCH LABORATORIES,** P.O. Box 81, Washington DC 20044. Please send $25.00 donation with $5.00 for S&H. RF445

**PRINTED CIRCUIT BOARDS** for projects in *73, Ham Radio, QST, ARRL Handbook.* List, SASE. **FAR CIRCUITS,** 18N640 Field Ct., Dundee IL 60118. RF595

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# activities calendar

Send your announcements to: Radio Fun Activities Calendar, 70 Route 202-N, Peterborough NH 03458. We'll print as many as space allows, on a "first come-first listed" basis.

**MAY 20**

**PADUCAH, KY** The Paducah ARA will hold its ARRL Major Event "Dukefest" at the Cherry Convention Center starting at 8 AM. Setup at 6 AM. Flea Market; Reserve tables early. Forums. VE Exams. Contact *David Fraser KQ4IU, 5715 Blandville Rd., Paducah KY 42001. Tel. (502) 554-7999.* Talk-in on 147.060.

**MAY 21**

**CAMBRIDGE, MA** A Tailgate Electronics/Computer/Amateur Radio Flea Market will be held 9 AM-2 PM at Albany and Main Sts., by the MIT Radio Soc. and the Harvard Wireless Club. For reservations and info, call *(617) 253-3776.* Mail advance reservations before May 5th to *W1GSL, P.O. Box 397082 MIT BR., Cambridge MA 02139-7082.* Talk-in on 146.52 and 449.725/444.725 pl 2A, W1XM/R.

**WOODBURY, NY** A Hamfest will be held at Briarcliffe College, 250 Crossways Pk. Dr., 9 AM-3 PM, by the Long Island Mobile ARC. VHF Tune-up Clinic. VE Exams 9:30 AM-10:30 AM. Talk-in on 146.25/.85. No advance tickets or tables. For more details, call *Neil Hartman WE2V, (516) 462-5549,* or *Mark Nadel NK2T, (516) 796-2366.*

**MAY 26-28**

**TULSA, OK** Maxwell Convention Center, Exhibit Hall A, W 7th St., between Denver Ave. & Houston Ave., is the location for the 1995 Green Country Hamfest & ARRL Oklahoma State Convention. Flea Market. Banquet ($20 advance reservation required). VE Exams Sat. & Sun. Forums. Storm Spotters meeting sponsored by the Nat'l Weather Service. ARRL meetings. Activities for non-hams. Talk-in on 146.88. Open autopatch on 145.27 during the event. Special hamfest discount at Double Tree Hotel across the street. Write to *Green Country Hamfest, Inc., P.O. Box 470132, Tulsa OK 74147-0132.* Dealers call *Charlie, (918) 241-4214.* For general info, call *(918) 272-3081; leave msg.* Also E-mail:*Merlin WB5OSM via Compuserve 73564,1063.*

**MAY 27**

**DURHAM, NC** The Durham FM Assn. will hold its 21st annual Hamfest/Computer Show at the South Square Shopping Mall, Highway 15-501 South and Chapel Hill Blvd., 8 AM-3 PM. Setup at 6:30 AM. VE Exams at 10 AM, prereg. requested. Exam contact is *Dave Snyder N2MLU, 600 S. Churton St. #64, Hillsborough NC 27278. Tel. (919) 644-8681.* Talk-in on 147.225(+600) and 145.45(-600). For Flea Market info, contact *Rodney Draughon KD4KMI, RT 4, Box 205, Rougemont NC 27572. Tel. (910) 364-7420.*

**MAY 27-28**

**CASPER, WY** The Wyoming State ARRL Hamfest will be sponsored by the Casper ARC Inc. Location: The Parkway Plaza, just off Interstate 25 and Center St. Banquet Sat. night. For details, contact: *C.A.R.C. Inc., W7VNJ, P.O. Box 2802, Casper WY 82602;* or *Steve Spier N7JUO, 3511 Swanton Ave., Casper WY 82604, Tel. (307) 265-6575;* or *Jim Boyer N7VLM, 2904 Meadow Dr., Casper WY 82604. Tel. (307) 237-0744.*

**MAY 28**

**BALTIMORE-WASHINGTON, MD** The Maryland FM Assn. will hold their annual Memorial Day Hamfest at the Howard Co. Fairgrounds, MD RT #144, West Friendship MD, from 8 AM-3 PM. Table reservations paid in advance only. Contact *Melvin Seyle WA3KZR, 15809 Pointer Ridge Dr., Bowie MD 20716. Tel. (301) 249-6147.* Talk-in on 146.76, 224.76, and 444.00.

**CHICAGO, IL** The Chicago ARC will hold its annual Hamfest at DeVry Inst. of Tech., 3300 N. Campbell, 8 AM-3 PM. Setup at 6 AM. Talk-in on 147.255(+), 444.825(+). Outdoor Swapfest. For reservations and info, call *(312) 545-4740;* or *(545) 3622;* or leave a message on *(312) 666-1606.* Write to *CARC, 5631 W. Irving Pk. Rd., Chicago IL 60634.*

**SOREL-TRACY, QUEBEC, CANADA** The Quebec Hamfest will be held in Sorel-Tracy at the Curling Club. For more info, write to *Club Radioamateur Sorel-Tracy, C.P. 533, Sorel, Quebec J3P 5N6, Canada.*

**JUNE 3**

**KNOXVILLE, TN** The Radio Amateur Club of Knoxville will hold its 29th annual Hamfest/Computer Fair at the Jacobs Bldg. in Chillowee Park from 8 AM-3 PM. Setup Fri. eve, and before the doors open on Sat. VE Exams. Talk-in on 147.30 and 224.50. Contact *Angela Crigger N4RPR, (615) 694-9071.*

**JUNE 4**

**BUTLER, PA** The 41st Breezeshooters' Hamfest will be held 8 AM-4 PM on the Butler Farm Show grounds. Talk-in on 147.96/.36. To reserve Flea Market tables, send check for $15 per table and an SASE to *Rey Whanger W3BIS, 5530 Cove Run Rd., Cheswick PA 15024-9451.* For General info call the *Breezeshooters' Hotline at (412) 828-3694.*

**MANCHESTER, MI** The 18th annual Chelsea Swap 'N Shop will be held by the Chelsea ARC, Inc. at the Chelsea Fairgrounds, starting at 8 AM. Flea Market Setup at 6 AM. Talk-in on 146.980 Chelsea Rptr. For info, mail your request with an SASE to *Chelsea ARC, Inc., P.O. Box 325, Manchester MI 48158;* or call *Gary R. Widmayer, (313) 428-9398.*

**MANASSAS, VA** *The Ole Virginia Hams ARC will sponsor the Manassas Hamfest/Computer Show at the Prince William County Fairgrounds, starting at 8 AM. Tailgaters 7 AM. Talk-in on 146.37/.97 and 223.06/224.66. Commercial vendors call* Joe K4FPT at (703) 257-9719. *For general info, call* Mary Lou KB4EFP at (703) 369-2877.

**JULY 27-30**

**COLORADO SPRINGS, CO** The Central States VHF Soc. will hold its annual conference July 27-30. Papers for inclusion in the conference proceedings, or for presentation at the conference are hereby solicited. Deadline for papers is early May, 1995. For info, please contact *Hal Bergeson W0MXY, Program Chairman, 809 East Vermijo Ave., Colorado Springs CO 80903. Tel. (719) 471-0238.*

**SPECIAL EVENT STATIONS**

**MAY 6**

**CHANCELLORSVILLE, VA** The Mt. Vernon ARC will operate NJ4F from "no man's land" on the original battlefield, to commemorate the 132nd Anniversary of the Civil War Battle of Chancellorsville. Operation will be in the General portion of the 40 and 20 meter phone bands. For a certificate, send QSL and SASE to *MVARC, P.O. Box 7234, Alexandria VA 22307 USA.*

KEYPORT, WA The North Kitsap ARC will operate WO7B 1600Z-2400Z to commemorate the opening of the Mines and Torpedoes exhibit at the Naval Undersea Museum. Operation will be in the lower end of the 40, 20, 15, and 10 meter bands. For a QSL, send QSL and SASE to *Robert J. Tomas N7KTP, 38119 Vista Key Dr. NE, Hansville WA 98340 USA.*

**MAY 6-9**

**FLOYD, VA** The Foundation for Amateur Internat'l Radio Service (FAIRS) will operate KK4WW, US5WE, UA4LCQ, 8R1WD and S21AM in their own countries 1400Z May 6th-1400Z May 9th, to celebrate the 4th Anniversary of FAIRS. Operation will be in the General portion of 40, 20 and 15 meters. For a certificate, send QSL and a 9" x 12" SASE to *FAIRS, P.O. Box 341, Floyd VA 24091 USA.*

**MAY 7**

**BOSTON, MA** In commemoration of VE Day, the Boston ARC will operate Station N1IST 1500Z-2100Z, from aboard the WWII destroyer USS Cassin Young, at Charlestown Navy Yard. Frequencies: HF and VHF, 7230, 14.230, 21.330, 28.330, 50.130 and 146.520. Work the Cassin Young and get a special QSL card, or come see us in person. For more info, contact *John Garrett WN9T, (617) 648-2523;* or *jgarrett@world.std.com.*

**MAY 7-21**

**HOLLAND, MI** The Holland ARC will operate K8DAA to celebrate Tulip Time. Operation will be in the lower portion of the General 20 and 15 meter subbands, and at 28.400. For a certificate, send QSL with call signs worked, and a 9" x 12" SASE to *Barbara Siebelink N8NXA, 6418 Otis Rd., Saugatuck MI 49453 USA.*

**MAY 20**

**KODIAK ISLAND, AK** The US Coast Guard ARC will celebrate Armed Forced Day by operating KL7HKX in the General class bands. Look for operators on the 20m band on 14.260 (IOTA frequency). To receive the Coast Guard ARC QSL card, use the following QSL info: *S/A/S/E please or via ARRL Bureau, United States Coast Guard ARC KL7HKX, P.O. Box 190421 USCG, Kodiak AK 99619-0421 USA.*

**MAY 20-21**

**SAN BERNARDINO, CA** The Citrus Belt ARC will operate W6JBT 1700Z May 20th-1700Z May 21st, to commemorate the Civilian Conservation Corps. activity in the San Bernardino Nat'l Forest 62 years ago. W6JBT will operate in the General portion of the 80 to 15 meter phone, Novice 10 meter phone subbands, and 2 meter packet. For a certificate, send QSL and 9" x 12" SASE to *W6JBT, P.O. Box 3788, San Bernardino CA 92413 USA.*

**MAY 20-22**

**OAK PARK, MI** The 1995 Michigan QSO Party will be sponsored by the Oak Park ARC. Operations will be 1800Z Sat., May 20th-0300Z Sun., May 21st; and 1100Z Sun., May 21st-0200Z Mon., May 22nd. Frequencies: CW - 1810, 3540, 3725, 7035, 7125, 14035, 21035, 21125, 28035, 28125. Phone - 1855, 3905, 7280, 14280, 21380, 28480. Contact *Jeffrey Albrecht N8WRY, 16193 Locherbie, Beverly Hills MI 48025* regarding logs; or *Oak Park ARC, 14300 Oak Park Blvd., Oak Park MI 48237 USA,* for rules.

**MAY 22-27**

**VAN ALSTYNE, TX** Amateur astronomers/Hams representing the southwest region of the Astronomical League will be operating Station K5GH at the 17th annual Texas Star Party. Operation will be +/- QRM: 28365, 21365, 14265 and 7265. SSTV and CW contacts on request. For an astronomical theme QSL card, send QSL/SWL report and SASE to *K5GH-TSP, 2619 Bordeaux, McKinney TX 75070 USA.*

**MAY 27-28**

**CLARE, MI** The Clare County ARES/RACES group AA8KP will operate 1200Z-0000Z to commemorate the 11th Wildlife Festival of Clare County. Operation will be in the lower portion of the General bands 15—80 and Novice 10 meter voice. For a certificate, send QSL and a 9" x 12" SASE to *Clare County EC, P.O. Box 262, Farwell MI 48622-0262 USA.*

**SUMTER, SC** The Sumter ARA will operate their annual Iris Festival Station, KQ7E, from the world famous "Iris Gardens," 2 PM EDT on the 27th-2 PM EDT on the 28th. Listen for them on the Lower 30 kHz on the General portions of 75, 40, 20, and on 28.300 thru 28.500. For a certificate, send $1 to *The Sumter ARA, P.O. Box 193, Sumter SC 29150 USA, ATTN: Special Event.*

**VICKSBURG, MS** The Vicksburg ARC will operate N5QDE in conjunction with the Re-enactment of the Siege of Vicksburg Civil War Battle. Operation will be in the General phone portions of 40, 20, 17, and 15 meters, and 28.465. For a special QSL card, send QSL and SASE to *Ed Magruder, 2485 Warrenton Rd., Vicksburg MS 39180 USA.*

**MAY 29**

**ELGIN, IL** The Elgin ARS will operate W9IKN to commemorate the annual running of the Valley Fox Trot 10 mi. race. Operation will be 1200Z-1700Z in the lower portion of the General subbands, on SSB and CW. 6 meters SSB, propagation permitting. For a certificate, send QSL and Business size SASE to *E.A.R.S., P.O. Box 1351, Elgin IL 60123-1351 USA.*

**JUNE 2-3**

**BATTLE CREEK, MI** Southern Michigan ARS will operate W8DF June 2nd 2100Z-June 3rd 2100Z, to commemorate "Urbandale Area Homecoming." W8DF will operate CW and SSB in the lower 25 kHz of the General 10-80 meter bands, and the Novice subbands. For a Special Event Card, send QSL to *W8DF, P.O. Box 934, Battle Creek MI 49016.*

**JUNE 2-4**

**DES ARC, AR** The North Central Arkansas ARS will sponsor Station KB5DBI June 2 1800Z-June 3 0200Z, and June 3 1600Z-June 4 0200Z, to commemorate Steam Boat Days. Operation will be in the General portions of 15, 20 or 40 meters, and the Novice portion of 10 meters, if conditions permit. For a QSL, send a 9" x 12" SASE (or send $1.00 and we will provide the envelope and postage) to *NCAARS, P.O. Box 911, Judsonia AR 72081,* or to *KB5DBI at the call book address.*

**HAINES FALLS, NY** The Long Island Mobile ARC's Junior Operators Committee will operate N2LSK from their QRP camping weekend at North Lake Camp Grounds in Greene County. Operation will be on or near 7.040, 3.560 CW and 7.225 phone. For QSL, send SASE to *Robert Todaro N2JIX, 2218 E. 73rd St., Brooklyn NY 11234.*

**NORTH OLMSTED, OH** The West Park Radiops ARC will operate W8VM on Satellite and HF June 3 0000Z-June 4 1600Z, in conjunction with All Scout Weekend. Operation will take place on satellites RS-10/11, RS-12, and RS-15, as the orbits and modes permit. When satellites are not available, W8VM may be found on 3.880, 7.280, and 14.280 MHz. CW operation will be 30 kHz up into the General portion of the CW bands, and in the Novice CW bands. QSL with regular SASE for a card, or 9" x 12" envelope for a special certificate. Mail to *W8VM, 513 Kenilworth Rd., Bay Village OH 44140.*

**TORONTO, CANADA** The Boy Scouts of Canada, Greater Toronto Region, will operate VE3TXU from Humber West Area Competition Camp. Operation will be Sat. June 3rd, 1300 UTC-1600 UTC, 1700 UTC-2000 UTC, and 2200 UTC-0000 UTC. Frequencies: 3.840, 3.940, 7.090, 14.135, 14.290, 21.360, 28.990. For a certificate, send a 9" x 12" SASE with QSL to *VE3TXU Jim Bois, 55 Alexander St., Tottenham Ontario, Canada L0G 1W0.*

**JUNE 4**

**PLYMOUTH, CT** Radio amateurs in Plymouth will operate designated stations to celebrate the bicentennial of the Town of Plymouth. A limited number of special certificates are being made available by the Bicentennial Committee to commemorate the contact. Operation will be in the General portions of 160, 80. 40, 20, 15, and 10 meters as propagation allows. QSL with an SASE to *K1EM, P.O. Box 12, Pequabuck CT 06781 USA.* Include a shipping container large enough to hold the 9 1/4" x 13 3/4" certificate, or a No. 10 business envelope for a folded certificate; along with sufficient return postage.

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| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 231 | 232 | 233 | 234 | 235 | 236 | 237 | 238 | 239 | 240 |
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| 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 251 | 252 | 253 | 254 | 255 | 256 | 257 | 258 | 259 | 260 |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 261 | 262 | 263 | 264 | 265 | 266 | 267 | 268 | 269 | 270 |
| 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 271 | 272 | 273 | 274 | 275 | 276 | 277 | 278 | 279 | 280 |
| 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 281 | 282 | 283 | 284 | 285 | 286 | 287 | 288 | 289 | 290 |
| 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 | 291 | 292 | 293 | 294 | 295 | 296 | 297 | 298 | 299 | 300 |
| 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 301 | 302 | 303 | 304 | 305 | 306 | 307 | 308 | 309 | 310 |
| 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 311 | 312 | 313 | 314 | 315 | 316 | 317 | 318 | 319 | 320 |
| 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | 321 | 322 | 323 | 324 | 325 | 326 | 327 | 328 | 329 | 330 |
| 131 | 132 | 133 | 134 | 135 | 136 | 137 | 138 | 139 | 140 | 331 | 332 | 333 | 334 | 335 | 336 | 337 | 338 | 339 | 340 |
| 141 | 142 | 143 | 144 | 145 | 146 | 147 | 148 | 149 | 150 | 341 | 342 | 343 | 344 | 345 | 346 | 347 | 348 | 349 | 350 |
| 151 | 152 | 153 | 154 | 155 | 156 | 157 | 158 | 159 | 160 | 351 | 352 | 353 | 354 | 355 | 356 | 357 | 358 | 359 | 360 |
| 161 | 162 | 163 | 164 | 165 | 166 | 167 | 168 | 169 | 170 | 361 | 362 | 363 | 364 | 365 | 366 | 367 | 368 | 369 | 370 |
| 171 | 172 | 173 | 174 | 175 | 176 | 177 | 178 | 179 | 180 | 371 | 372 | 373 | 374 | 375 | 376 | 377 | 378 | 379 | 380 |
| 181 | 182 | 183 | 184 | 185 | 186 | 187 | 188 | 189 | 190 | 381 | 382 | 383 | 384 | 385 | 386 | 387 | 388 | 389 | 390 |
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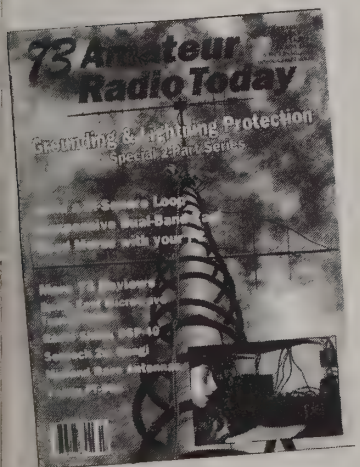


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## BOOKS FOR BEGINNERS

**TAB4354 The Beginner's Handbook of Amateur Radio, Third Edition** *by Clay Laster W5ZPV*, 395 pages. Wonderful book for newcomers. It is basic and well illustrated. Even if you have all the other ham handbooks, you'll still find this one useful. **$22.00**

**W5GWNC Technician Class License Manual: New No-Code** *by Gordon West* This book covers everything you need to become a Technician Class Ham. Every question and answer on the examinations is found in this one book. FCC Form 610 application. **$9.95**

**XTAL-1 The Crystal Set Handbook** *by Phil Anderson WØXI.* Want to give a kid an exciting present? Or maybe yourself? Crystal sets are alive and fun. Here's a whole book packed with crystal set circuits that anyone can build. Now start saving those oatmeal boxes, okay? 133 pages **$10.95**

**AR4432 W1FB's Help for New Hams** *by Doug DeMaw W1FB* Complete for the newcomer. Put together a station and get on the air. **$10.00**

## WAYNE WRITES

WG1 **We The People *Declare War* On Our Lousy Government**—360p soft cover. This is Wayne's report explaining what the major problems are facing both New Hampshire and the country, and proposing simple, inexpensive solutions: a simple way to have government departments happily cut their expenses by 50% within three years; how to cut the cost of incarcerating prisoners by over 90%; how to end welfare; how to reduce the deficit; how to cut medical costs and improve health care; how to cut school costs and improve schools. An absolute steal at **$13**.

WG4 **20/20 Foresight**—Twenty 16p updates on the **Declare War** book—320p. Further proposals for solving critical American problems, such as a new approach to financing small businesses, how to finance Russia and other countries and make a profit doing it, the real dope on bioelectromagnetics, a new kind of polytechnical university, a new electronics technology, why Africa is in such a mess, why Perot bombed, how to have tuition-free universities, a plan for making Congress turn honest, etc. Plenty more. Ridiculously priced at **$10**.

WG5 **Submarine Life in WWII**—60p. Wayne's story of his adventures on the USS Drum SS-228 on five war patrols in the Pacific in 1943-45. What's it really like on a submarine when you're being depth charged? And what's the day-to-day life on a submarine like? Did you see the movie Das Boot? Exciting stuff and only **$7.50**.

WG6 **Uncle Wayne's Caribbean Adventures**—96p. Wayne's adventures scuba diving all around the Caribbean, visiting ham operators, and sightseeing. If you're interested in how to travel economically, you'll get some great ideas from this. He starts out with his "Diving, the Wimp Sport." You'll love the visits to 11 islands in 21 days trip. A measily **$7.50**.

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## ARRL BOOKS

AR1995 **ARRL 1995 Handbook (71st Ed.)** Features: added DSP, improved treatment of Pi and Pi-L, all new all-digital-logic, plus lots more. **$30.00**

AR1086-4 **ARRL Operating Manual (4th Ed.)** Information on how to make the best use of your station, including: interfacing home computers, OSCAR, VHF-UHF. **$18.00**

AR3657 **QRP Notebook** *by Dave DeMaw W1FB* Presents construction projects for the QRP operator. **$10.00**

AR3207 **W1FB's Design Notebook** *by Dave DeMaw W1FB* Filled with simple practical projects that can be built using readily available components and common hand tools. **$10.00**

AR0402 **Solid State Design** Good, basic information, circuit designs and applications; descriptions of receivers, transmitters, power supplies, and test equipment. **$12.00**

AR4173 **Now You're Talking! All You Need To Get Your First Ham Radio License (2nd Edition)** A complete study guide for the Technician and Novice written exam. Practical information every beginner needs is written clearly and simply and in small doses. **$19.00**

AR4718 **ARRL Repeater Directory 1994-1995** 19,000+ listings with digipeaters, bandplans, CTCSS (PL(TM)) tone chart, frequency coordinators, ARRL special service clubs, and beacon listings from 14 MHz to 24 GHz. **$6.00**

AR3398 **The DXCC Companion** *by Jim Kearman KR1S* Spells out in simple, straightforward terms what you need to be a successful DXer. **$8.00**

AR1250 **Log Book**—Spiral **$3.50**

AR3177 **The ARRL Spread Spectrum Source Book.** From a deceptively simple beginning, a group of experimenters set out to develop first theoretical and later practical systems for spread spectrum communications. This book consists of articles, papers and government reports that document the process whereby amateur spread spectrum progressed from the drawing board to the airwaves. **$20.00**

AR2960 **Transmission Line Transformers (2nd Ed.)** *by Dr. Jerry Sevick W2FM1* Practical designs and specific information on construction techniques and sources of material. **$20.00**

AR3851 **Hints and Kinks** Ideas for setting up your gear for comfortable, efficient operation. **$10.00**

ARRL **License Manuals** Complete FCC question pools with answers.

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| AR4181 **Technician Class** | $ 6.00 |
| AR4688 **General Class** | $12.00 |
| AR3274 **Advanced Class** | $ 8.00 |
| AR3282 **Extra Class** | $ 8.00 |

AR3185 **The Satellite Experimenter's Handbook, (2nd Ed.)** *by Martin Davidoff K2UBC* Expanded and revised. Focusing on satellites built by and for the international radio amateur community. **$20.00**

AR2030 **Your Gateway to Packet Radio (2nd Ed.)** Tells everything you need to know about this popular new mode. **$12.00**

AR4645 **Satellite Anthology** The latest information on OSCARs 9 through 13 as well as the RS satellites, the use of digital modes, tracking antennas, RUDAK, microcomputer, and more! **$10.00**

AR4483 **Weather Satellite Handbook (4th Ed.)** *by Dr. Ralph Taggart WA8DQT* Expanded and revised to reflect today's weather-fax satellite technology. **$20.00**

AR4653 **Companion Software for Weather Satellite Handbook** 5 1/4" MS-DOS Floppy. **$10.00**

AR2083 **Complete DX'er (2nd Ed.)** *by Bob Locker W9KI* Learn how to hunt DX and obtain hard-to-get QSL cards. **$12.00**

AR3762 **Your QRP Operating Companion** No special rigs or expensive equipment to enjoy the excitement and challenge of low-power operating. **$6.00**

AR3169 **QRP Classics** Compilation of ARRL publications on building receivers, transmitters, transceivers, accessories. **$12.00**

AR4270 **FCC Rule Book** A must for every active radio amateur. **$9.00**

AR0356 **Morse Code: The Essential Language** *by L. Peter Carron, Jr. W3DKV* Expanded and revised in its 2nd edition. How to handle distress calls heard not only on the hambands but on maritime and aircraft frequencies. **$6.00**

AR3983 **Understanding Basic Electronics** An ARRL book. 314 big pages. This explains everything very simply: the math, DC, AC, transistors, even tubes (wow!). Dirt cheap at $17. Isn't it about time you understood the fundamentals? **$17.00**

## REFERENCE

RS-1 **The Amateur Radio Mail Order Catalog and Resource Directory, 4th Edition** is the most comprehensive source book for electronic parts, software, and equipment targeted at the radio amateur or serious electronic hobbyist anywhere! Plus a wealth of "value-added" reference material all in 262 pages. 4th Edition clearance at only **$8.95**. (was $16.00)

TAB2701 **Transmitter Hunting** *by Joseph Moell and Thomas Curlee* Radio direction finding simplified. **$19.95**

UE202 **RTTY Today** *by Dave Ingram* Modern guide to amateur radioteletype. **$8.95**

TP002 **The World Ham Net Directory** *by Mike Witkowski* New—2nd edition. Introduces the special interest ham radio networks and shows you when and where you can tune them in. **$9.50**

WGP87158 **1995 North American Callbook** The 1995 North American Callbook lists the calls, names, and address information for 500,000+ licensed radio amateurs in all countries of North America. **$35.00**

MMH24 **Radio Handbook, 23rd Ed.** *by William I. Orr W6SAI* 840 pages of everything you wanted to know about radio communication. **$39.95**

WGP1234 **1995 International Callbook** The new 1995 International Callbook lists 500,000+ licensed radio amateurs in the countries outside North America. It covers South America, Europe, Africa, Asia, and the Pacific area (exclusive of Hawaii and the U.S. possessions). **$35.00**

W5GWNV **No-Code Video, Manual, Part 97 Rules** Learn how to be a ham radio operator. **$29.95**

AR4092 **Your RTTY/AMTOR Companion** invites you to explore the world of HF digital communications. If you've never operated RTTY or AMTOR before, this book is written expecially for you! You won't find complicated technical jargon here. Just information you can use right away. You'll discover how to . . . Assemble your own RTTY/AMTOR station . . . Use RTTY and AMTOR to talk to amateurs throughout the world . . . Compete in RTTY/AMTOR contests . . . Hunt for digital DX. **$8.00**

AR3754 **Radio Frequency Interference—How to find it and fix it.** Interference problems are challenging, but curable. With the techniques in this book, you can help restore electronic peace in your neighborhood. **$15.00**

DOV41 **Basic Electronics** *Prepared by the Bureau of Naval Personnel* Covers the important aspects of applied electronics and electronics communications. **$12.95**

DOV76 **Second Level Basic Electronics** *Prepared by the Bureau of Naval Personnel* Sequel to Basic Electronics, thorough treatment of the more advanced levels of applied electronics. **$9.95**

20N096 **How To Read Schematics (4th Ed.)** *by Donald E. Herrington* Written for the beginner in electronics, but it also contains information valuable to the hobbyist and engineering technician. **$19.95**

WLSWOCP **Radio Operator's World Atlas** *by Walt Stinson, WØCP* This is a compact (5x7), detailed, and comprehensive world atlas designed to be a constant desk top companion for radio operators. **$17.95**

TAB37109 **Secrets of RF Circuit Design** *by Joseph J. Carr* Written in clear non-technical language, covers everything from antennas to transistors. **$21.95**

## SOFTWARE

**GGTE Morse Tutor** From beginner to Extra Class. Code from 1 to over 100 words per minute. Standard or Farnsworth mode. Create your own drills. Exams conform to FCC requirements. 5 1/4" floppy for IBM PC, XT, AT, PS/2 or compatibles.

| | |
|---|---|
| **GG52/5 Morse Tutor** 5.25" Disk | **$19.50** |
| **GG31/2 Morse Tutor** 3.5" Disk | **$19.50** |
| **GGADV5 Gold Edition** 5.25" Disk | **$29.95** |
| **GGADV3 Gold Edition** 3.5" Disk | **$29.95** |

W5GWHO **Ham Operator Education Package Software,** Novice—Extra for PC's, contains both 3 1/2" and 5 1/4" disks. **$39.95**

W5GWNSW **No-Code Ham Radio Software Package for PC's,** contains both 3 1/2" and 5 1/4" disks. **$29.95**

**Lanze Code Programs—(Available on 5 1/4" * disk.)** Inexpensive complete study guide code programs for both the C64/128 Commodores and the IBM compatibles. Programs include updated FCC questions, formulas, schematic symbols, diagrams, and simulated (VE) sample test.

| | IBM Part# | Commodore Part# | Price |
|---|---|---|---|
| Novice | LZIBM01 | LZCOM01 | $14.95 |
| Tech | LZIBM02 | LZCOM02 | $14.95 |
| General | LZIBM03 | LZCOM03 | $14.95 |
| Advance | LZIBM04 | LZCOM04 | $19.95 |
| Extra | LZIBM05 | LZCOM05 | $19.95 |

* Add $2.00 for 3 1/2" Disk

## STUDY AIDS

**VIS Study Cards** Compact, up-to-date Flash Cards with Key Words, Underlined, Quiz on back. Formulas worked out. Schematics at your fingertips. Used SUCCESSFULLY by ages 6 to 81!

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| NOVICE | VIS01 | $11.95 |
| TECH | VIS02 | 10.95 |
| GENERAL | VIS03 | 9.95 |
| ADVANCED | VIS04 | 15.95 |
| EXTRA | VIS05 | 14.45 |

## ANTENNAS

AR4114 **Low Profile Amateur Radio** For the Ham who lives where antennas are frowned upon. From hiding your antenna to operating with low power. This books tells you how to get on the air using these tehniques, and others,without calling attention to yourself. **$8.00**

UE220 **The Easy Wire Antenna Handbook** *by Dave Ingram K4TWJ.* All of the needed dimensions for a full range of easy to build and erect "sky wires." **$9.95**

WGP87034 **All About Cubical Quad Antennas** *by William Orr and Stuart Cowan* "The Classic" on Quad design, theory, construction, operation. New feed and matching systems. New data. **$11.95**

TAB 3270P **Practical Antenna Handbook**—Second Edition, 1994, Joseph Carr; Tab Books. This 560-page book is a real treasure. Sarts with the fundamentals of antenna and feedline theory, explains about propagation of all kinds, and then provides a ton of easy antenna construction projects. Covers antennas and feeders for all bands. The explanations are simple and well illustrated, with some math, where it's unavoidable, but it won't bog you down. It even has the ZL-Special antenna, which I've used on 20m with some spectacular DXing success. A low angle of radiation and made it so I could always work the rare stuff first . . . Wayne. **$26.95.**

AR4734 **ARRL Antenna Book** The new 16th Edition represents the best and most highly regarded information on antenna fundamentals, transmission lines, design, and construction of wire antennas. **$30.00**

AR0194 **Antenna Compendium Vol. 1** Materials on verticals, quads, loops, yagis, reduced size antennas, baluns, Smith Charts, antenna polarization. **$10.00**

AR2545 **Antenna Compendium Vol. 2** Covers verticals, yagis, quads, multiband and broadband systems, antenna selection. **$12.00**

AR2626 **Companion Software for Antenna Compendium Vol. 2** 5 1/4" MS-DOS floppy. **$10.00**

AR4017 **Antenna Compendium Vol. 3** More verticals, yagis, quads, plus loops, arrays, mobile, direction finding, controlled currents, computerized, installation, overloads, plus 40 new articles for beginner's to advanced. **$14.00**

AR4661 **Antennas and Techniques for Low-Band DXing** can be your ticket to low-band success. Drawing on the experiences of successful DXers and the author's own considerable experience, John Devoldere, ON4UN, shares the tips and techniques that can make the difference between a station that takes part in a contest and one that wins it! **$20.00**

AR3819 **Physical Design of Yagi Antennas** *by David B. Leeson W6QHS* provides the tools here to design and build robust Yagi antennas, using sound mechanical engineering principles. You need no longer fear the consequences of wind or ice storms on your antennas. With this information, you can build or "beef up" existing Yagis. **$20.00**

AR2618 **W1FB's Antenna Notebook** *by Dave DeMaw W1FB* Get the best performance out of unobtrusive wire antennas and verticals. Build tuners and SWR bridges. **$10.00**

WGP87107 **All About Vertical Antennas***by William Orr* Comprehensive coverage of amateur communications. **$11.95**

WGP87042 **Beam Antenna Handbook** *by William Orr and Stuart Cowan* Everything you need to know about beam design, construction, and operation. **$11.95**

WGP87077 **Simple, Low-Cost Wire Antennas For Radio Amateurs** *by William Orr and Stuart Cowan* All New! Low-cost, multi-band antennas; inexpensive beams, "Invisible" antennas for hams in "tough" locations! New data. **$11.95**

AR2200 **Antenna Impedance Matching** *by Wilfred N. Caron* Most comprehensive book written on using Smith Charts in solving impedance matching problems. **$20.00**

AR0410 **Yagi Antenna Design** A *Ham Radio* series polished and expanded by Dr. Lawson. **$15.00**

AR2995 **Reflections** will help dispel the half-truths and outright myths that many believe are true about transmission lines, standing waves, antenna matching reflected power and antenna tuners. **$20.00**

AR3118 **Reflections**—Software for IBM 5-1/4" **$10.00**

## UHF/VHF PACKET

ARTSCI **U.S.Repeater Mapbook** *by Robert Martin* The Guide for traveling radio amateurs. **$9.95**

TP001 **The Basic Guide to VHF/UHF Ham Radio** *by Edward M. Noll* Provides a first rate introduction to the 2.6 and 1.25 meter bands as well as 23, 33, and 70cm. **$6.95**

AR3959 **Your Packet Companion** Perfect for the packet newcomer. **$8.00**

AR3878 **Your VHF Companion** Explore the fascinating activities on the VHF bands, FM and repeaters, packet, CW & SSB, Satellites, ATV, transmitter hunting and more. **$8.00**

## LAST CHANCE

***ONLY A FEW LEFT***

PC5066 **Digital Logic Gates and Flip-Flops** *by Ian R. Sinclair* A firm foundation in digital electronics. Treats the topics of gates and flip-flops thoroughly from the beginning. **$18.00**

PC5113 **Electronic Test Equipment Handbook** *by Steve Money* A guide to electronic test equipment for the engineer, technician, student and home enthusiast. **$18.00**

PC5007 **Practical Digital Electronics Handbook** *by Mike Tooley BA* Contains nine digital test gear projects. Digital circuits, logic gates, bistables and timers, microporcessors, memory and input/output devices. **$14.50**

## UNCLE WAYNE'S PICKS

WG2 **The Million Dollar Video** Explains how just about any company can increase sales by over a million dollars through the sneaky (aka intelligent) use of promotion. Explains in detail how you can get tons of free advertising. Uncle Wayne shows you how to beat the system. **$39.95**

**"SEEK YOU" by The Ham Band**—The titles include "Always on the air", "On the Monday Evening Grayline", "Radio Widow", "The Trip to Dayton", "The Contest" and seven more. Ham radio CD includes experiences that radio hams go through. This is an extremely entertaining CD and will strike a chord with any radio ham, SWL or XYL—an ideal present! **SYCD $15 SYTAPE $10.**

IB8657 **Dumbing Us Down: The Hidden Curriculum Of Compulsory Schooling.** *by John Gatto* If you enjoyed "Declare War", you'll enjoy this also. A Wayne Green recommended reading. **$9.95.**

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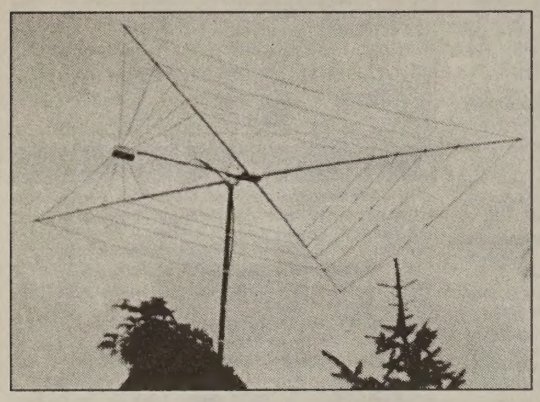
# new products



## WB2GMK ANTENNAS

WB2GMK Antennas has announced the "CobWebb," a highly-efficient, limited space HF antenna designed by Steve Webb G3TPW, and manufactured by SRW Communications in Yorkshire, England. This antenna covers 14, 18, 21, 24 and 28 MHz with a square design only 8 feet on each side. It weighs only 14 lbs. (6 kg), so it mounts easily on a lightweight TV-type pole. Despite this ultra-compact design, the manufacturer's specifications indicate that the antenna functions at the same efficiency as a full-size, half-wave dipole on each band.

The CobWebb's horizontal polarization greatly minimizes RFI problems when compared to a vertical or vertically-polarized loop. Plus, it is extremely widebanded on all bands, yet still exhibits a remarkable efficiency due to its exact match to 50-ohm coax. Its pure omnidirectional pattern, with virtually no nulls, makes it an excellent choice for DXing from small sections of real estate where larger arrays are impractical or not permitted.

The antenna will easily handle a full gallon and is rated to withstand 100 mph winds. It is extremely easy to assemble and install due to the use of Fiberglas spreaders and supports, as well as a preassembled feedbox and resonators.

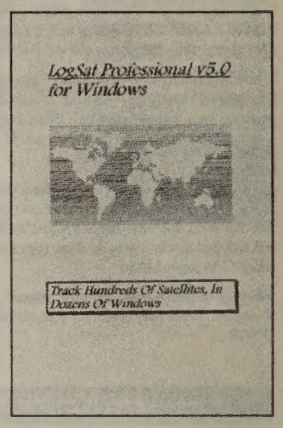
The CobWebb is priced at $318 plus shipping. For more information, contact *WB2GMK Antennas, 2219 High Point Drive, Brandon, FL 33511; phone or fax (813) 653-3131.* Or circle Reader Service No. 201.

## LOGSAT SOFTWARE CORPORATION

LogSat Software Corporation has formed a joint international business venture to develop, produce and distribute a commercial satellite tracking program called "LogSat Professional version 5.0 for Windows."

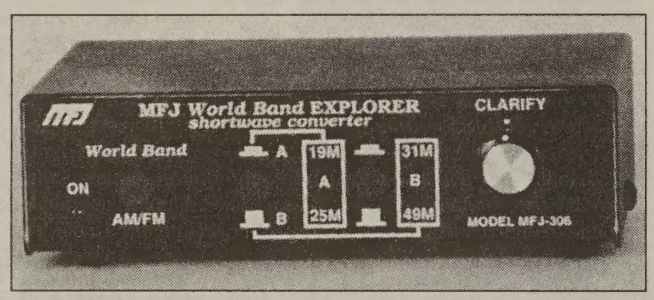
LogSat Professional allows both experienced and inexperienced computer owners to track thousands of satellites in dozens of Windows with all types of visual graphics. The program can be used by everyone from home-based owners with satellite dishes who want to watch overseas programs, to ham radio operators and professional ship/aircraft captains who rely on GPS tracking fixes.

For the price and more information, contact *LogSat Software Corporation, 425 S. Chickasaw Tr., Suite 103, Orlando, FL 32825; (800) 350-3871.* Or circle Reader Service No. 202.




## MFJ

MFJ Enterprises, Inc. has announced the MFJ-306 World Band Explorer Mobile Shortwave Converter, which allows you to visit the world while you drive. The MFJ-306 will convert your AM car radio into a world band shortwave receiver at the push of a button. Unlike local FM and AM radio stations that fade out after a few miles, the MFJ World Band Explorer will let you enjoy worldwide shortwave stations throughout an entire trip, day or night, providing programming that cannot be found on AM or FM radio, or even on cassette tapes. It will monitor the entire 19, 25, 31 and 49 meter international shortwave broadcast bands.




The World Band Explorer is very easy to install and use. It works on all car radios, even the newer digitally functional dials. It measures just 5 x 1-1/2 x 3-1/2 inches, and has a push-button to select world band reception or your AM/FM radio. And, it comes with MFJ's famous "No Matter What" one-year unconditional guarantee.

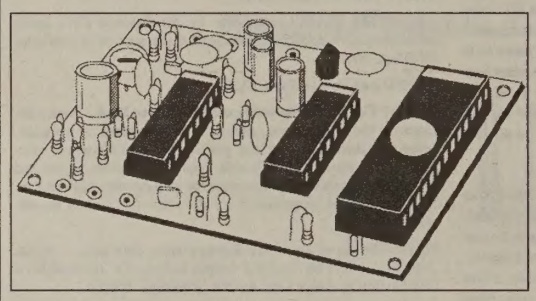
The MFJ-306 is priced at $79.95. For more information or to order, contact any MFJ dealer or *MFJ Enterprises, Inc., P.O. Box 494, Mississippi State, MS 39762; or call (601) 323-5869, fax (601) 323-6551, or order toll-free at (800) 647-1800.* Or circle Reader Service No. 203.

## XURON CORPORATION

XURON Corporation is offering a new catalog that includes a full line of specialty hand shears, flush cutters, wire cutters, pliers, crimpers and compact pneumatic cutters for industrial or electronic assembly and field service use. XURON's Timeless Engineering Catalog describes over 100 variations of ergonomically designed special purpose shears and flush cutters that feature XURON's patented Micro-Shear bypass technology, which provides a clean square cut using less force than conventional compression cutters.

Featuring product descriptions, dimensional drawings and full-color photographs, the 24-page catalog has a section that explains the ergonomic enhancements designed into the tools, such as cushioned rubber hand grips. Other products include solder resists, desoldering braid dispensers, tweezers and dispensing bottles.

The Timeless Engineering Catalog is available free from *XURON Corporation, 60 Industrial Park Rd., Saco, ME 04072; (207) 283-1401, fax: (207) 283-0594.* Or circle Reader Service No. 207.

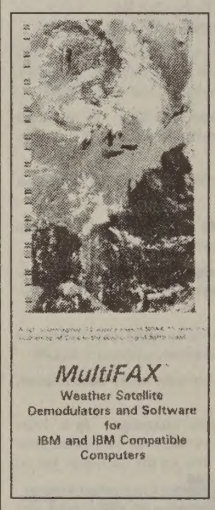



## HAMTRONICS

Hamtronics' new CWID-2 Module provides, in response to customer requests, just the CWID portion of the original CMOS COR-4 Module. The CWID-2 Module features small size, ease of assembly and maintenance, versatility, and a thorough manual that describes how to take advantage of all the available options. It uses all CMOS logic, operates on 7-15 V at only 3 mA, and is easy to fit into existing enclosures because of its small size (only 1-3/4 x 3-1/8 inches). The factory programmed EPROM saves assembly time and allows longer messages than the earlier diode-matrix type CWID module—enough room for up to 200 characters. The CWID-2 can also be set to repeat a message continuously for beacon operation.

The unit has adjustable output level, tone, speed, and interval timer. Installation is easy; the thorough manual describes how to adapt the CWID-2 for various applications.

For the price and more information, contact *Hamtronics, Inc., 65-F Moul Rd., Hilton, NY 14468-9535; (716) 392-9430, fax (716) 392-9420.* Or circle Reader Service No. 204.




## MULTIFAX

MultiFAX has announced Version 7 of the MFMAP software used with the MultiFAX WEFAX Image Capture System. This software is used to control the MultiFAX demodulator, as well as to capture and process (enhance, zoom, grid, colorize, etc.) the resulting satellite images. This new version, MFMAP7, sets the standard for power, speed and ease of use.

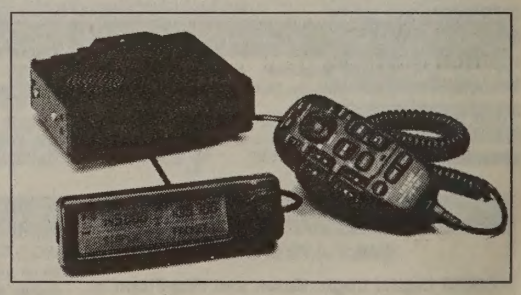
While retaining all of the functions of earlier versions, MFMAP7 contains the following new features: built-in satellite tracking, real-time on-screen output of the elevation and azimuth of the polar orbiting satellites, automatic computer controlled tracking capability (for use with the Kansas City Tracker), Record Level Meter with a graphical display of signal level, a new record option for NOAA satellites using the onboard crystal clock, easier image enhancement (using the new Palette Function), and MFREC and TIMER software to make unattended recording a snap.

MFMAP7 is priced at $49 plus S&H for MFMAP6 users; it is supplied with all new MultiFAX demodulator purchases after April 5, 1995. For more information, contact *MultiFAX, Route 1, Box 27, Peachland, NC 28133; (704) 272-9028, fax (704) 272-9036, BBS (716) 425-8759.* Or circle Reader Service No. 205.

## YAESU

The FT-8500 from Yaesu is a deluxe compact FM mobile transceiver for both 2 meter and 70 cm operation. It includes two new features unique to this mobile: the FS-10 Smart Controller Microphone, and Spectra-Analyzer. For the first time ever, all radio functions are housed in the microphone. The FS-10 all-in-one Smart Controller Microphone permits total transceiver control from the palm of your hand. With its unique joystick-type lever, tuning and menu programming are now quick and straightforward.

Spectra-Analyzer allows you to view channel occupancy above and below your current operating frequency. A simple turn of the dial centers a signal of interest on the scope. Spectra-Analyzer also allows you to watch activity within your memory banks.



The FT-8500 is the first Yaesu mobile with a rear-panel data jack for packet. It has six-pin connections for data input, PTT, 9600 bps and 1200 bps receive data, squelch status, and ground.

For more information, contact *Yaesu USA, 17210 Edwards Road, Cerritos, CA 90703; (310) 404-2700.* Or circle Reader Service No. 206.

# What You Missed in 73 Amateur Radio Today

If you don't read the May issue of *73 Amateur Radio Today,* here is some of what you're missing:

• Mike (WB8VGE) Bryce's "Builder's Guide to the Universe" shares practical, "learned from long experience" advice on planning and building your next project. And the next one. And the one after that.

• And with "Wart Remover," Bryce offers a worthy project, a build-it-yourself device to eliminate "wall warts," those pesky, unsightly, tangle-y little power supplies you plug into wall outlets to power everything from cassette tape players to HTs.

• John R. Bolduc N1QGS reviews "The Trident TR-1200 Wide-Range Monitor Scanner," a new scan-it-all hand-held scanner covering everything from 500 kHz to 1300 MHz in AM, FM Wide, and FM Narrow (and a newer model that includes SSB and CW). Must reading.

• Jeff Gold AC4HF builds and reviews "The Oak Hills Explorer Kit," What's this inexpensive, high quality little QRP capable of? Quite a bit, it seems. Jeff tells it all.

• Six meters has been getting increasing attention nowadays, and with good reason. Gordon West WB6NOA gives a fine tour of "6 Meters—The In-Between Band." Find out why this band is picking up in popularity.

• Of course, once you're fired up to try 6 meters, you'll need a rig. "Gordo" has that covered, too, in his review of "The Alinco DR-MO6," a new 6 meter mobile transceiver that offers an inexpensive way to get on the band in style.

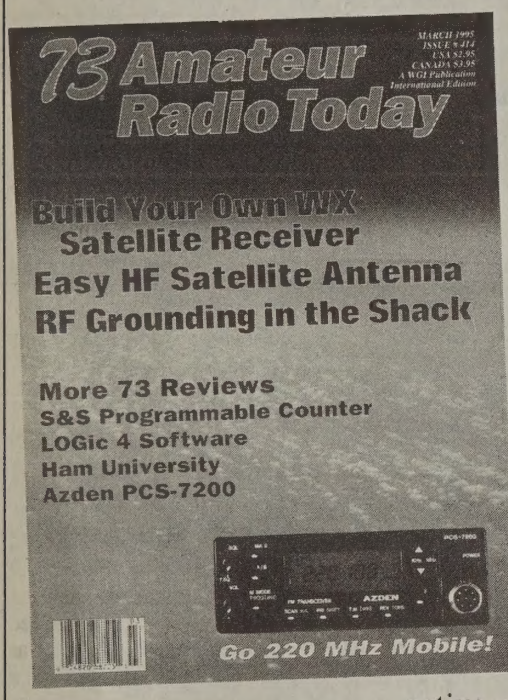
• Can a mobile HF antenna as small as "The Comet HA4S" perform as well as its larger counterparts? Reviewer Barry Kennedy N2PNG gives his opinions.

• When commercial AC mains power goes kablooey, how do you keep your repeater (or other important gear) running? Charles M. Seay, Sr. KN4HL shows you how to build "A Foolproof Power Controller" to handle the situation reliably and with ease.

• Everett James K4SYU takes you step by step in building the portable "K4SYU Loop Antenna." Can a loop antenna this small be efficient? Absolutely!

• You've also missed our regular monthly columns on radio direction finding, radioteletype, VHF/UHF/microwave, low power (QRP), questions and answers, hints, and more.

You should read the May issue, and *every* issue, of ***73 Amateur Radio Today!*** Order now and save $15 off the cover price. You'll receive a one-year subscription (12 issues in all) to the best ham magazine money can buy, for just $19.97. For instant service call toll-free (800) 289-0388. Do it now! RF




# What Does It Take

...to get you to subscribe to *73?* Sure, we could give you a lot of history to show how *73* has had a powerful influence on ham radio as it is today. But what you want to know is what can *73* do for you right now.

1) One of the most fun parts of hamming is buying a new piece of gear and using it. But you sure want to know all you can about it before buying, right? *73* has more equipment reviews than any other ham rag, and almost always has 'em first.

2) Unless you're a real nerd, you want to know how to get active on packet, the ham satellites, slow-scan, and all the other exciting adventures amateur radio has waiting for you. *73* has been the leader in new ham modes ever since it started. And Wayne was doing the same thing when he started *Amateur Radio Frontiers* magazine in 1951. He was pushing ham teletype then. Still is, for that matter. Then, as the editor of *CQ* for five years, he pushed SSB and NFM. Then, after being fired because *CQ* owed him too much money, he started *73,* where his long editorials have been urging hams to try new things, learn more, and be entrepreneurs, since 1960. Wayne's editorials have helped hundreds of hams become millionaires.

3) One of the more fun things in hamming is building gadgets. *73* has more simple construction projects than the other ham rags combined. Plus lots of reviews of kits. You'll have a ball with some of the QRP rigs and kits.

4) Antennas? You'll read about a ton of new ideas in antennas. Here's one area of hamming that you can experiment with and have fun.

5) Wayne's done just about everything there is to do in hamming, and he generally helped pioneer new modes. He's visited over 130 countries and operated from over half of them. He went on his first DXpedition in 1958 to Navassa as KC4AF. Almost got killed. So when he writes his editorials urging you to try something new, he's usually done it himself.

6) Once you start reading his editorials you'll be hounding the flea markets for back issues. With over a thousand of his provocative, and often controversial, editorials published so far, that'll keep you busy for a while. Wayne sure says what he thinks. But he does his homework first, so the chances are that if you don't agree with him, it may be you who needs to do the homework, not him. Wayne predicted the cellular telephone industry before it happened. He did the same with microcomputers, starting the first magazine in the field, and then with compact discs, again with a magazine. He's into cold fusion now with a new magazine. It costs $98 a year for a subscription, so you'll probably cry poverty and miss the next huge industry that's about to get started, and miss out on being a millionaire again. Tsk. But that's the price for being chintzy.

7) Speaking of chintzy, you might enjoy reading about Wayne's travels. He calls it being thrifty. He's written several of these travelogs with the day-to-day stories of his trips. You'll enjoy them. Check the Uncle Wayne's Bookshelf ad for details. You could do worse than read his ***Declare War*** book too. Thousands of hams have read and enjoyed it.

8) Meanwhile, at least read *73* so you can keep up with what's happening.

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Hear exciting air-craft communications—pick up planes up to 100 miles away! Receives 110-136 MHz AM air band, smooth varactor tuning superhet with AGC, ceramic filter, adjustable squelch, excellent sensitivity and lots of speaker volume. Runs on 9V battery. Great for air shows or just hanging around the airport! New 30-page manual details pilot talk, too. Add case set for "pro" look.

AR-1 kit.....**$29.95** Matching case set, CAR ...**$14.95**

## FM RECEIVERS & TRANSMITTER

Keep an ear on the local repeater, police, weather or just tune around. These sensitive superhet receivers are fun to build and use. Tunes any 5 MHz portion of the band and have smooth varactor tuning with AFC, dual conversion, ceramic filtering, squelch and plenty of speaker volume. Complete manual details how the rigs work and applications. 2M FM transmitter has 5W RF out, crystal control (146.52 included), pro-specs and data/mike inputs. Add our case sets for a nice finish.

FM Receiver kit Specify band: FR-146 (2M), FR-6 (6M), FR-10 (10M), FR-220 (220MHz).....**$29.95**
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FT-146 Two Meter FM transmitter kit.....**$79.95**

## MICRO-MIKE

World's smallest FM wireless mike. Smaller than a sugur cube - including battery and mike. Two sets of SMT parts supplied in case you are clumsy! Terrific audio pick-up (pin drop at 5 ft) and transmit range of 300 ft. We include the battery (watch style), electret mike and even a tuning tool! Be a James Bond and learn SMT too!

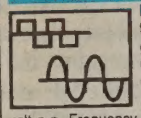
FM-5 Micro mike kit.....**$19.95**

## FM WIRELESS MIKES

Pick the unit that's right for you. All units transmit a stable signal in the 88-108 MHz FM band up to 300' except for High power FM-4 and PB-1 Phone bug that go up to 1/2 mile.

FM-1 Basic unit.....**$5.95**
FM-2, as above but with added mike pre amp.....**$7.95**
FM-4, long range with very sensitive audio pickup.....**$14.95**
PB-1, Phone bug needs no battery, hooks to phone line.....**$14.95**
MC-1, Micro size sensitive mike cartridge for FM-1,2,4.....**$2.95**

## SYNTHESIZED AUDIO GENERATOR



DDS (Direct Digital Synthesis) technology brings you a terrific audio generator at a fantastic price! Generates from 0. 01 Hz to 50 KHz with five digit LED display of frequency. Sine and square wave output adjustable 0-5 volt p-p. Frequency selected by direct keyboard entry and with handy continuous tune tuning knob. Crystal controlled accuracy of 10 ppm and two memories for rapid frequency changes. Retire that jury-rigged old generator and treat yourself to the pleasure of using a new state-of-the-art SG-550!

SG-550 Kit..**$199.95** SG-550WT assembled .....**$269.95**

## SHORTWAVE RECEIVER

Fantastic receiver that captures the world with just a 12" antenna! Can receive any 2 MHz portion from 4-11 MHz. True superhet, has smooth varactor tuning. AGC, RF gain control, plenty of speaker volume and runs on a 9V battery. Fascinating Scout, school or club project, provides hours of fun for even the most serious DXer. For the car, consider our shortwave converter. Two switchable bands (in 3-22 MHz range), each 1 MHz wide—tunable on your car radio dial. Add some interest to your drive home!

Shortwave receiver kit, SR1.....**$29.95**
Shortwave converter kit, SC1.....**$27.95**
Matching case set for SR1, CSR.....**$14.95**
Matching case set for SCI, CSC.....**$14.95**

## AM TRANSMITTER

High quality, true AM broadcast band transmitter is designed exactly like the big commercial rigs. Power of 100 mW, legal range of up to 1/4 mile. Accepts line level inputs from tape and CD players and mike mixers, tunable 550-1750 KHz. Complete manual explains circuitry, help with FCC regs and even antenna ideas. Be your own Rush Limbaugh or Rick Dees with the AM-1! Add our case set for a true station look.

AM-1 Transmitter kit.....**$24.95**
CAM Matching case set.....**$14.95**

## SCANNER CONVERTER

Tune in on the 800-950 MHz action using your existing scanner. Frequencies are converted with crystal referenced stability to the 400-550 MHz range. Instructions are even included on building high performance 900 MHz antennas. Well designed circuit features extensive filtering and convenient on-off/bypass switch. Easy one hour assembly or available fully assembled. Add our matching case set for a professional look.

SCN-1 Scanner converter kit.....**$49.95**
SCN Matching case set.....**$14.95**
SCN-1WT Assembled SCN-1 and case.....**$89.95**

## SURROUND-SOUND/REVERB

Add concert hall realism to your stereo, TV or even 2-way radio! Easily sythesize a stereo effect from mono sources or richly enliven regular music. Add a big-voice reverb to your radio voice that others will envy! Our reverb/surround sound kit uses a Bucket Brigade IC Device for reliable solid-state performance. Adjustable reverb, delay and mix controls to customize your sound. Easily connected to radios, stereos, CB's and TV's. Plently of audio to drive a small speaker for stand-alone operation too. Experierence the fun and realism that surround sound provides - without spending hundreds! Add our case set for a neat, pro look.

RV-1 Surround Sound/Reverb kit.....**$59.95** CRV Matching case set.....**$14.95**
RV-1WT Assembled RV- 1 and case.....**$99.95**

## TOUCH-TONE REMOTE CONTROL

Control virtually anything by Touch-Tone remote control. The URC-1 has 16 switched outputs, 4 adjustable voltage outputs (20 mV steps 0 to 5 VDC), two 10K digital pots (for volume, squelch, etc.) and 3 timers adjustable from 10 mS to 40 hours! Two level password control allows secure control and multi-level access. Six digit LED display shows currently entered codes and a crystal controlled touch-tone decoder provides reliable operation. There's nothing else like this unit, be in complete control of remote radios, thermostats, hi-fi's, homes or even factories with the URC-1. Add our matching case set for a handsome finish.

URC-1 Remote control kit.....**$129.95** CURC Matching case set.....**$14.95**
URC-1WT Fully assembled URC-1 and case.....**$189.95**

## FM SUBCARRIER DECODER

Tap into the world of commercial-free music and data that is carried over many standard FM broadcast radio stations. Decoder hooks to the demodulator of FM radio and tunes the 50-100 KHz SCA subcarrier band. Many radios have a demod output, but if your radio doesn't, it's easy to locate, or use our FR-1 FM receiver kit which is a complete FM radio with a demod jack built-in. These "hidden" subcarriers carry lots of neat programming - from stock quotes to news to music, from rock to easy listening - all commercial free. Hear what you've been missing with the SCA-1.

SCA-1 Decoder kit.....**$27.95** CSCA Matching case set.....**$14.95**
FR-1 FM receiver kit.....**$24.95** CFR Matching case for FR-1.....**$14.95**

## L-C METER

Measure inductors from 10 uH-10mH and capacitors from 2 pF-2uF with high accuracy by connecting the LC-1 to any digital multimeter. Two pushbutton ranges for high resolution readings and we even give you calibration components to assure proper accuracy of your kit! Active filters and switching supplies require critical values, no one should be without an accurate LC meter. For a pro look, add our matching case set.

LC-1 LC meter kit.....**$34.95** CLC case set.....**$14.95**

## MOTOR CONTROLLER

Control the speed and direction of any motor. Use our SMD-1 for those nice steppers you see surplus, and our MSC-1 for DC motors. The stepper driver features variable speed, half step rotation, direction and power down mode, can drive most any stepper motor. Our DC driver features pulse width modulation control allowing full motor torque even at low speeds and can drive motors up to 50 VDC @ 10 Amps! Add our case set for a professional assembly.

SMD-1 Stepper kit.....**$24.95** MSC-1 DC motor kit.....**$24.95**
CSMD SMD-1 case.....**$14.95** CMSC MSC-1 case.....**$14.95**

## STEREO FM TRANSMITTER

Run your own Stereo FM radio station! Transmits a stable signal in the 88-108 MHz FM broadcast band up to 1 mile. Detailed manual provides helpful info on FCC regs, antenna ideas and range to expect. Latest design features adjustable line level inputs, pre-emphasis and crystal controlled subcarrier. Connects to any CD or tape player, mike mixer or radio. Includes free tuning tool too! For a pro look add our matching case set with on-board whip antenna

FM-10A Stereo transmitter kit.....**$34.95**
CFM Case,whip ant set.....**$14.95**

## DR. NI-CAD CONDITIONER/FAST CHARGER

Quit spending big bucks for replacement battery packs, rejuvenate and condition your batteries for peak capacity. Advanced circuitry has optimized discharge before charge to eliminate memory effect and to condition batteries that have been poorly cared for in the past. Quick charge rapidly brings battery to full charge in less than an hour-just 15 minutes for some types! And "top-off" charge mode squeezes every last bit of energy into each cell for the absolute most capacity. Switch-mode regulator controls constant current charge while being monitored by a negative delta-V system that cuts off the fast charge at the exact point of full charge-batteries are charged, not cooked! Charges NiCads or NiMH packs from 2 to 10 cells (easily expanded) and current capacities up to 10 Amp-hours. Runs on 12 to 15 VDC. Quit cooking your batteries, buying new packs, waiting hours for recharge, get a Dr. Ni-Cad today! Available in money saving kit form or wired and tested with case at a special price. Kit builders: add our matching case set for a snazzy finish.

DN-1 Dr. Ni-Cad conditioner/fast charger kit.....**$49.95**
CDN Matching case set.....**$14.95**
DN-1WT Fully assembled Dr. Ni-Cad with case.....**$89.95**

## SPEED RADAR


New low-cost microwave Doppler radar kit "clocks" cars, planes, boats, horses, bikes or any large moving object. Operates at 2.6 GHz with up to 1/4 mile range. LED digital readout displays speed in miles per hour, kilometers per hour or feet per second! Earphone output allows for listening to actual Doppler shift. Uses two 1-lb coffee cans for antenna (not included) and runs on 12 VDC. Easy to build—all microwave circuitry is PC stripline. ABS plastic case with speedy graphics for a professional look. A very useful and full-of-fun kit.

SG-7 Complete kit.....**$99.95**

## STEREO PEAK HOLD BARGRAPH

Finally a dual LED bar graph with a peak hold display! Bar graph displays are neat and eye catching but their speed is their downfall - they just can't capture the peaks. Our kit is like two units in one, a fast display to show the signal and a long persistance display to capture peaks, similar units go for hundreds of bucks! We offer 3 models: Linear for general use, Semi-Log for audio VU meters, and Log for power displays. Dual - for stereo! - 10 segment multi-colored LED display for snazzy, eye grabbing display and easily set ranges for virtually any signals, from voltmeters to audio VU meters to audio power amps to SWR meters. Complete intructions for easy hook-up to most any device. Add our matching case set for a sharp looking unit.

PH-14 Dual Linear bargraph kit.....**$39.95** PH-15 Dual Log bargraph kit ..**$39.95**
PH-16 Dual Semi-Log bargraph kit.....**$39.95** CPH Matching case set .....**$14.95**

## SPEECH SCRAMBLER

Descramble most scramble systems heard on your scanner radio or set up your own scambled communication system over the phone or radio. Latest 3rd generation IC is used for fantastic audio quality - equivalent to over 30 op-amps and mixers! Crystal controlled for crystal clear sound with a built-in 2 watt audio amp for direct radio hook-up. For scramble systems, each user has a unit for full duplex operation. Communicate in privacy with the SS-70. Add our case set for a fine professional finish.

SS-70 Scrambler /descramblerkit ....**$39.95**
CSSD matching case set.....**$14.95**
SS-70WT Assembled SS-70 and case set .....**$79.95**

## CRYSTAL RADIO

Relive the radio past with a crystal set like your grandfather built. Uses genuine Galena crystal and catwhisker. Several different types of radios are built, including standard AM broadcast, shortwave and even WW II foxhole style. To compare modern semiconductor detectors, we include a diode for comparison. No soldering required and we even give antenna ideas. Radio for free, get it now before Clinton taxes it!

CS-1 Crystal set kit.....**$19.95**

## TOUCH-TONE DECODER

Grab Touch-Tone numbers right off the air, phone or tape. A simple hook-up to any radio speaker or phone line is all that is required to instantly decipher touch-tone phone numbers or codes. A 256 digit memory stores decoded numbers and keeps its memory even in the event of power loss. An 8 digit LED display allows you to scroll through the memory bank to examine numbers. To make it easy to pick out number groups or codes, a "dash" is inserted between sets of digits that were decoded more than 2 seconds apart. A "central-office" quality crystal controlled decoder is used allowing rapid and reliable detection of numbers at up to 20 digits per second! For a professionally finished look, add our matching case set. Start cracking those secret codes tomorrow with the Tone Grabber!

TG-1 Tone Grabber kit.....**$99.95** CTG Matching case set.....**$14.95**
TG-1WT Fully assembled TG-1 and case.....**$149.95**

## DIGITAL VOICE RECORDER

Chatterbox digital voice storage unit will record your message of up to 20 seconds. Time is split up into four 5 second blocks which can be played separately or cascaded for longer messages. An LED display shows message location and current mode for easy operation. Nifty built-in interfaces allow simple connection to transmitters for automatic keying when the PTT is initially closed or after it is released. You can even loop your rig's mike through the Chatterbox. For contest or fun use, the CB-1 can drive an external speaker. Includes a built-in electret mike. For that finishing touch, add our matching case set.

CB-1 Voice recorder kit.....**$59.95** CCB Matching case set .....**$14.95**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